s issue: **Pressworking Beryllium • Tool Brazing • Screw Machine Feeds**

TOOLING and PRODUCTION

Putnam *adds* more so you can *remove* more — easier. Extra operations are added to normal practice in grinding end teeth, so you can be certain of non-clogging, free cutting. The special relief thus produced by Putnam eliminates chip-trapping pockets, tends to force chips out.

For the best in end mill performance, specify Putnam — made by end mill specialists.

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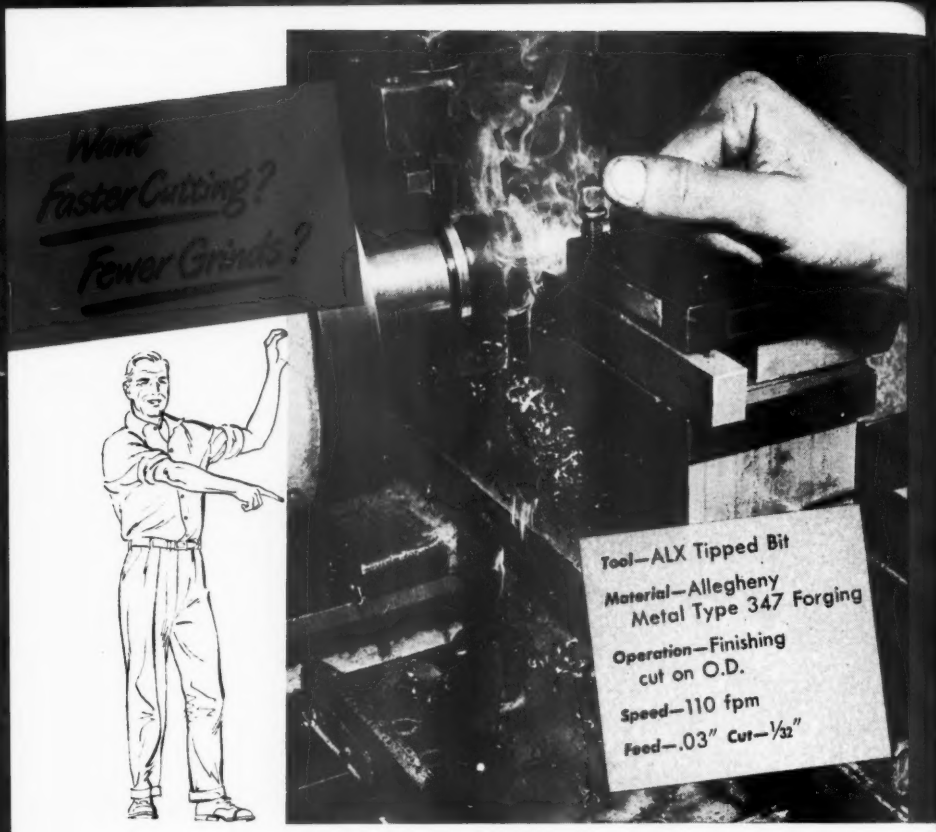

. . . then get ALX ALLOY Cutting Tools

Write for copy of

"ALX ALLOY TOOL BITS"

An eight-page booklet tells how you can effect production economies by using ALX for fast turning, boring, and facing—in certain applications. Helpful information includes grinding, tool angles, speeds and feeds, brazing of tips. *Write for your copy.*

ADDRESS DEPT. TD-35

Many a machine shop—and probably yours—has jobs on which ALX Tipped Tools or ALX Solid Bits step up production by permitting increased speeds, feeds, and depths of cut. Resharpening is less frequent, the reason being special composition.

ALX is a cast-to-shape, nonferrous, cobalt-base alloy containing chromium, tungsten, carbon, and boron. The as-cast hardness of 60-62 Rockwell C obviates later heat treatment. Tools stay sharp at accelerated speeds and higher temperatures. Speed range is above that of high-speed steel, but lower than with carbide. At such intermediate speeds, the superior performance of ALX results from toughness, red-hardness, edge-strength, and abrasion-resistance values combined.

An Allegheny Ludlum tool engineer can quickly point out the strategic spots to tool up with ALX. For this service, call A-L.

● *Allegheny Ludlum Steel Corporation, Forging and Casting Division, Wanda & Jarvis Avenues, Detroit 20, Michigan.*

For complete **MODERN** Tooling, call

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FINE TOOL STEELS
SINCE 1854

W&D 3485-B

The Only AIR CYLINDER with all controls Built-In!

STANDARD SIZES

Bellows Air Motors are made in five bore sizes: 1¼", 1¾", 2½", 3⅛", 4½", and in any stroke length.

●

All Bellows Air Motors are available with either the built-in electrically controlled Electro-aire Valve or manually controlled valve, and in a wide range of mounting styles. Model shown is equipped with the Electroaire Valve.*

*TM Registered Patent Applied For.

The Bellows Air Motor combines in one compact, complete power unit: double-acting air cylinder, four-way electrically-controlled directional valve, and speed regulating valves.

Instant Action

No lag between the movement of the valve and the action of the piston.

Accurate Speed Control

Piston rod speed in either or both directions can be precisely regulated, *with no power loss.*

Compactness

Streamlined, space-saving, design fits into crowded quarters or on moving machine elements.

Simplified Installation

Installation is quicker . . . easier. The *one* air connection needed can be made with flexible air hose.

If you use air cylinders, you will save time, money, and space with the Bellows Air Motor — the only air cylinder with all controls built in.

Address: Dept. TDJ 1152 1213

Write for New Bulletin CL-30

Specifications, wiring diagrams, design and construction detail.

The Bellows Co.

TOOLING and PRODUCTION

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Faster - Better - More Economical grinding and finishing of many parts now being filed, milled, disc ground, shaped, etc. can be done on Hammond 8" Abrasive Belt Platen Grinders

Model V-8WP
Two other 8" models available

SAMPLES — Send one rough and one finished sample for engineering report — no obligation

Hammond Machinery Builders INC.
1631 DOUGLAS AVENUE ● KALAMAZOO, MICHIGAN
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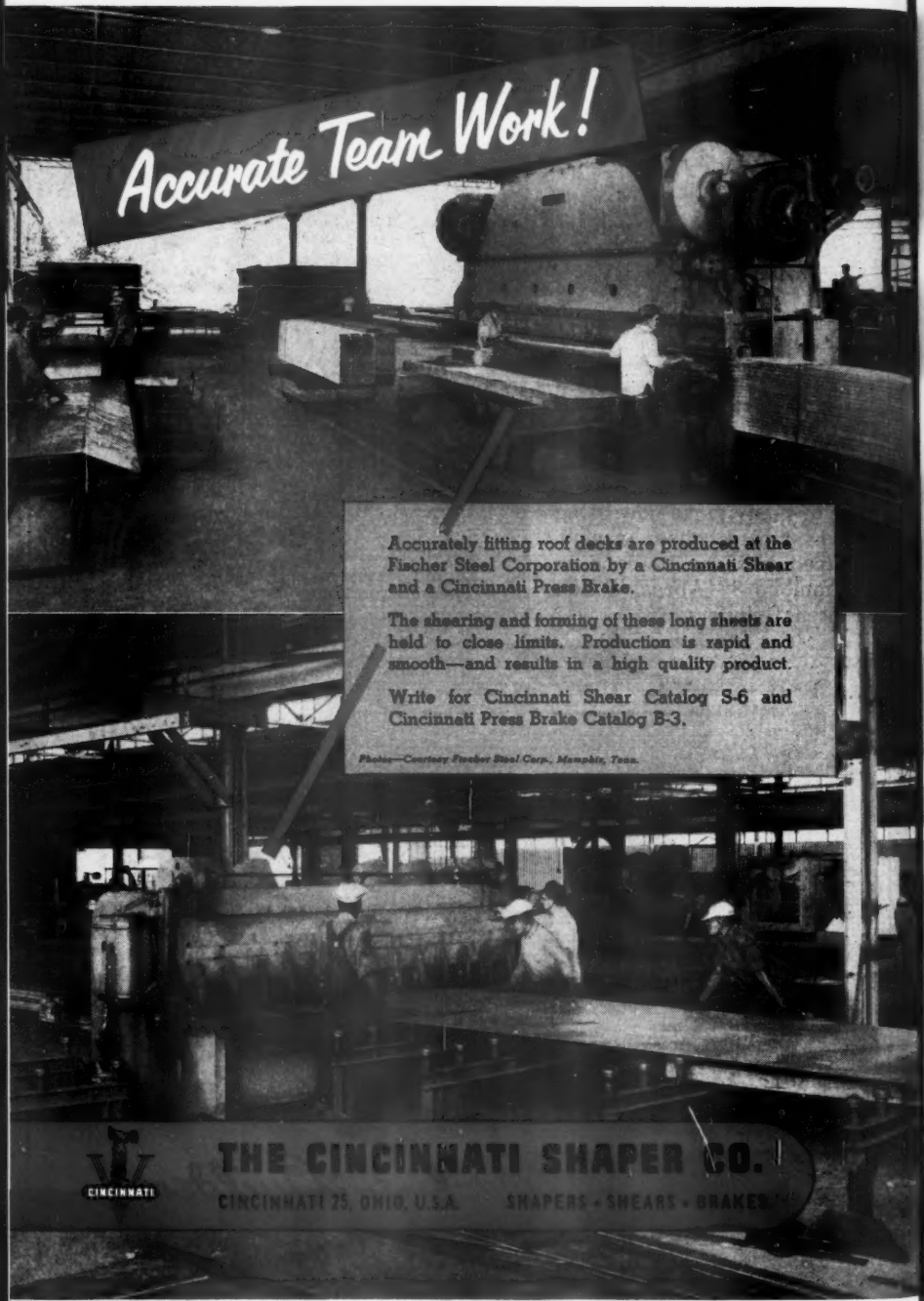
Accurate Team Work!
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SHAPERS • SHEARS • BRAKES

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with Continental Counterbores . . .

You can reduce your tool cost, improve accuracy, and increase production with the Continental complete line of standard drive interchangeable cutting tools. Cutters have a balanced, indestructible drive—originated by Continental—that will not stick, will not break, and is hand detachable after toughest cuts.

Order through your local Ex-Cell-O representative or write to Continental in Detroit.

CONTINENTAL TOOL WORKS
Division of Ex-Cell-O Corporation
DETROIT 32, MICHIGAN

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NEW INTRIMIK

Internal Tri-point Micrometer

measures **any** size bore or hole within range of tool... ***without masters***

Now you can realize new economies and speed by measuring bores and holes *directly* with the new Brown & Sharpe Intrimik Internal Tri-point Micrometer. It's a big time and money saver... eliminates the need for expensive plugs and setting rings. Intrimiks measure in increments of .0001" on bore sizes from .275" to .500", and in increments of .0002" on bore sizes from .500" to 4.000". Extensions are available to facilitate measuring deep holes. Write for new illustrated Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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You bet I'm concerned about carbide segregation

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Just exactly what is carbide segregation . . . ?
Why should I worry about carbide segregation . . . ?
How can I test for carbide segregation . . . ?
Does size have any effect on carbide segregation . . .

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Yes! Please send me the booklet,
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City ..... Zone ..... State .....

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Eliminate the designing and making of clamps and other fixture parts.

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Large Factory and Distributor Stocks Assure Quick Deliveries.

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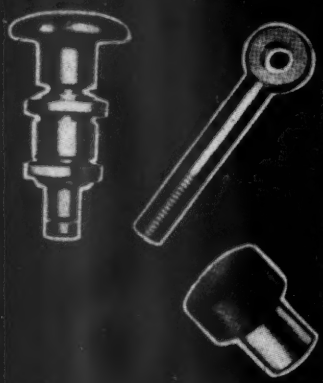

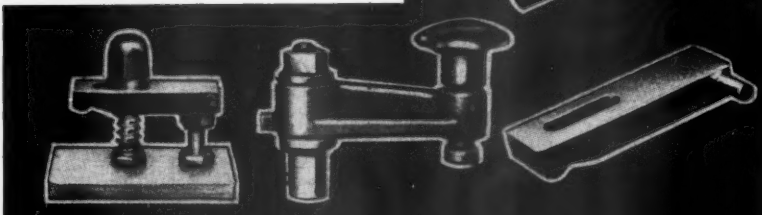

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Cuts Boring Time on Columns

75% with BUNELL TOOLING

● The Greaves Machine Tool Company of Cincinnati, Ohio, a leading manufacturer of Milling Machines, has reduced the time required for boring their machine columns by 75% with Bunell Tooling.

● Greaves is also consistently obtaining a greater degree of precision and accuracy by the use of Bunell Boring Fixtures and Boring Bars (illustrated above). Time and labor savings like this speed production and help Greaves reduce costs and meet shorter delivery requirements of customers.

● Bunell's complete modern plant facilities and experienced engineering staff are available to help you with your tooling problems. Write for full information.

WRITE FOR FREE CATALOG which describes Bunell services, facilities and equipment.

THE BUNELL MACHINE & TOOL CO. CLEVELAND, O.

BUNELL MACHINE AND TOOL CO.

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Since 1920, Designers and Builders of Special Tools, Dies, Jigs, Fixtures and Special Machines

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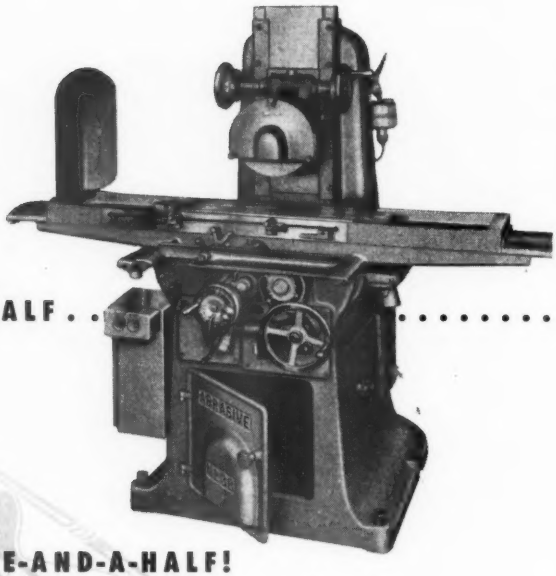

This **TON-AND-A-HALF . . . . . .**

. . . *cuts* TIME-AND-A-HALF!

CONDENSED SPECIFICATIONS

TYPE: Horizontal spindle, reciprocating table, mechanical feeds.

CAPACITY: 24" long x 8" wide x 12" high.

FEEDS: Automatic in longitudinal and transverse directions.

Automatic cross feed (0 to .070" at either or both ends of table travel).

WHEEL: Standard Type 1 — 10" diam. driven by 3 HP, 1750 RPM motor.

ABRASIVE No. 3-B eliminates costly overtime in production and toolroom surface grinding.

There's 3,000 lbs. of precision workmanship in each Abrasive No. 3B Surface Grinder . . . designed specially to get grinding jobs out on time EVERY TIME! If the job calls for heavy cuts, the No. 3B will take them. If the work must be held within very close tolerances, the Abrasive No. 3B is the grinder for the job. If surface finish is a primary consideration, again it's wise to put the job on the No. 3B.

Wherever high quality surface grinding is required — in automotive, aircraft, toolmaking, and countless other types of plants — you'll save time and trouble by relying on the Abrasive No. 3B. May we send you descriptive Bulletin and complete specifications? Write today to the Abrasive Machine Tool Company, 16 Dunellen Road, East Providence 14, R. I.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

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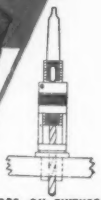
NEW DRILL STOP

...a positive control for depth of hole

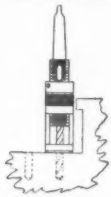
by SJ SCULLY JONES

End Guesswork and Reduce Rejects:
You often require close control of depth for operations —as in center drilling, drilling and reaming— on turret lathes, radial drills and other machines. On these operations, or wherever a quick change arrangement is used in one station for sequence operations, you hold uniform hole depth by using the new S-J Drill Stops. They provide a positive stop which ends guesswork and reduces rejects.

Quick and Easy to Insert, Remove and Adjust Tools:
Simply loosen set screw and slip stop collar from threaded shank for quick insertion or removal of taper shank tools. The threaded lock bushing provides quick and accurate adjustment of the stop collar. Only a quarter turn of the set screw forces the bushing against the shank threads for a positive lock.



STOPS ON FIXTURE BUSHING OR WORK



Work on Close Centers:
The small body diameter permits you to operate these Drill Stops on close centers and near shoulders or other obstructions.

Trouble-Free Performance:
S-J Drill Stops are made from an alloy steel with all points of wear hardened for long life. The four chip grooves tend to break up and remove any chips from the surface on which it stops. Investigate the use of S-J Drill Stops wherever you require a positive control for depth of hole. Made in 8 sizes having Morse Taper shanks and holes.

Write for BULLETIN NO. 18-50 for data on Drill Stops.

Scully-Jones AND COMPANY
1913 S. Rockwell St., Chicago 8, Ill.

R-5-28MT

YOU GET LOW COST FAST ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

DIAL FOR ACCURATE

High Speed Inspection

Depth Gage. Readings to 1/1000th.

1" Range Dial Indicator. Adaptable to many tools. Readings to 1/10,000th.

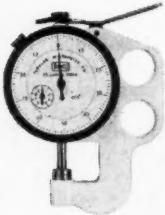
When your production must be held to close tolerances there's a Tumico Dial Indicator gage that will make high speed, accurate inspections. High visibility dials give instant and accurate readings. Our complete and diversified line may provide exactly the right type of dial indicator gage to best speed and insure accurate inspections.

Let our engineers examine your product inspection problem. Write for new catalog showing additional models.

DIAL FOR ACCURATE

High Frequency Checking

1" Range Dial Indicator. Attaches to many tools. Readings to 1/1000th.



Lever Action Hand Thickness Gage with 1" Throat Depth. Readings to 1/1000th.

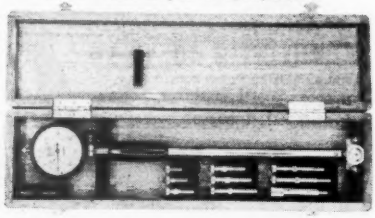
"Quality Control" of production lines can often be improved and speeded up by frequent spot checking with Tumico Dial Indicator hand and bench gages. High visibility assures quick, accurate readings to check vital production points.

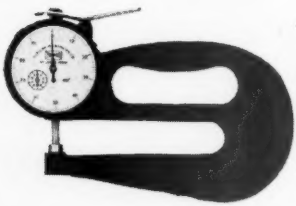
Our production engineering department may be able to help you. Write us your problem. Our recommendations and complete catalog showing gages not illustrated will be sent promptly.

TUMICO DIAL INDICATORS

TUBULAR MICROMETER CO., Box 30, St. James, Minn.

Dial Bore Depth Gage. Range from 2" to 6" in 10" Bore Depth in 5/10,000ths.





Lever Action Hand Thickness Gage with 4" Throat Depth. Readings to 1/1000th.

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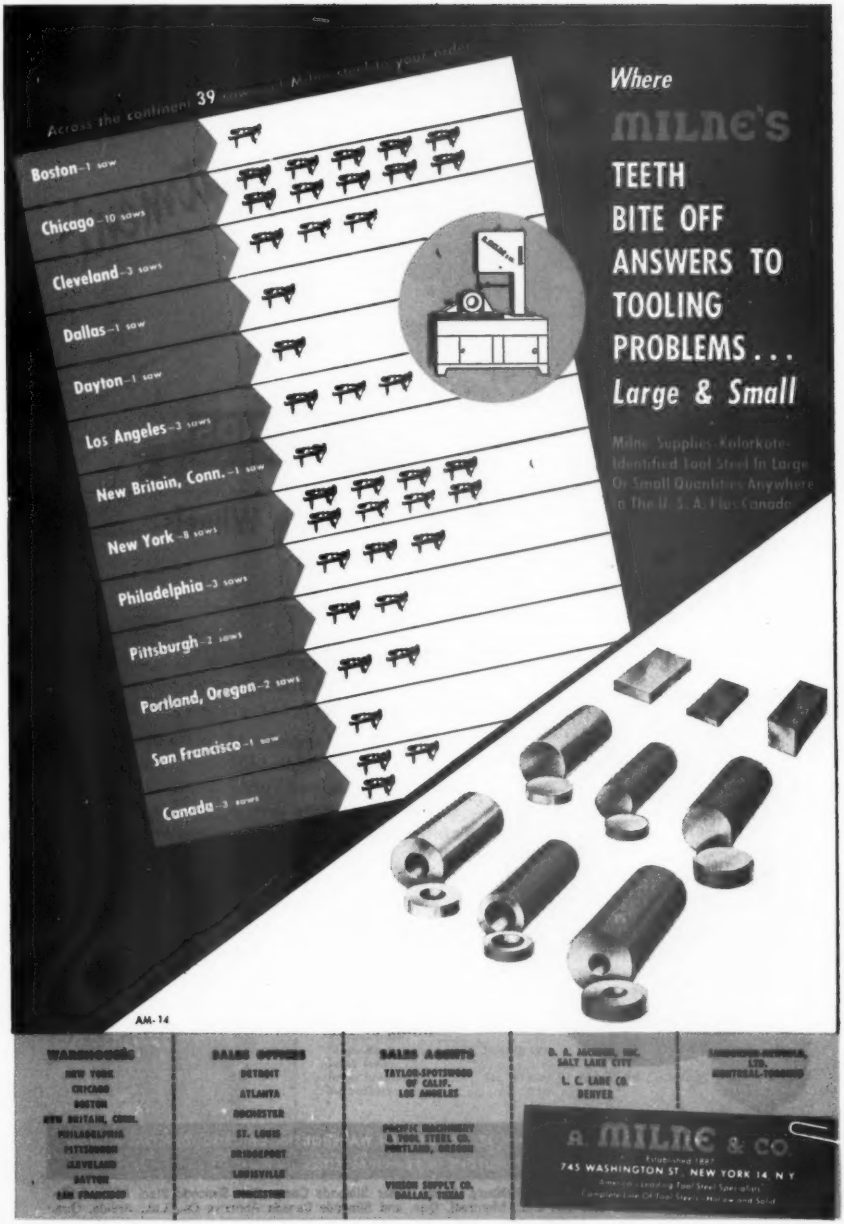

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Production Rhythm for the Grinding Department

SIMONDS ABRASIVE CO.

Grinding Wheels

Keep your production line humming. Get in tune for maximum output with Simonds Abrasive Co. grinding wheels.

You will find plenty of satisfaction, savings and serviceability in these accurately specified production tools. Right now they're proving their adaptability, efficiency and economy in every phase of industrial grinding from production snagging to micro-inch finishing. Complete line includes grinding wheels, mounted wheels and points, segments and abrasive grain.

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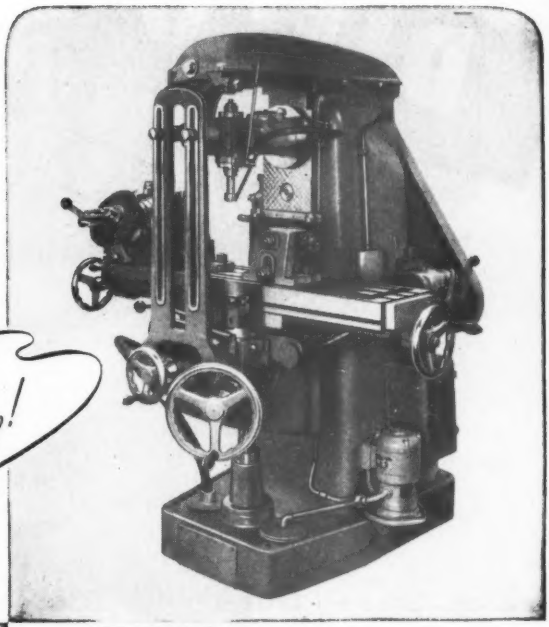
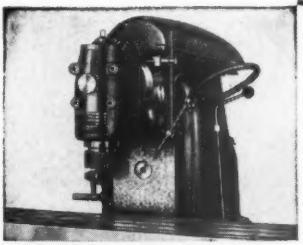


Swedish Craftsmanship!



Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ **Standard Equipment Includes:**
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ **Extra Equipment:**
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41⅛" x 9¼"
Longitudinal travel: Plain Miller	24⅛"
Universal Miller	27⅛"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight—2200 lbs.

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NO PRIORITY——PROMPT DELIVERY——ATTRACTIVE PRICE

AUSTIN INDUSTRIAL CORP. 76-X MAMARONECK AVE. WHITE PLAINS, N. Y.
DEALERS IN PRINCIPAL CITIES

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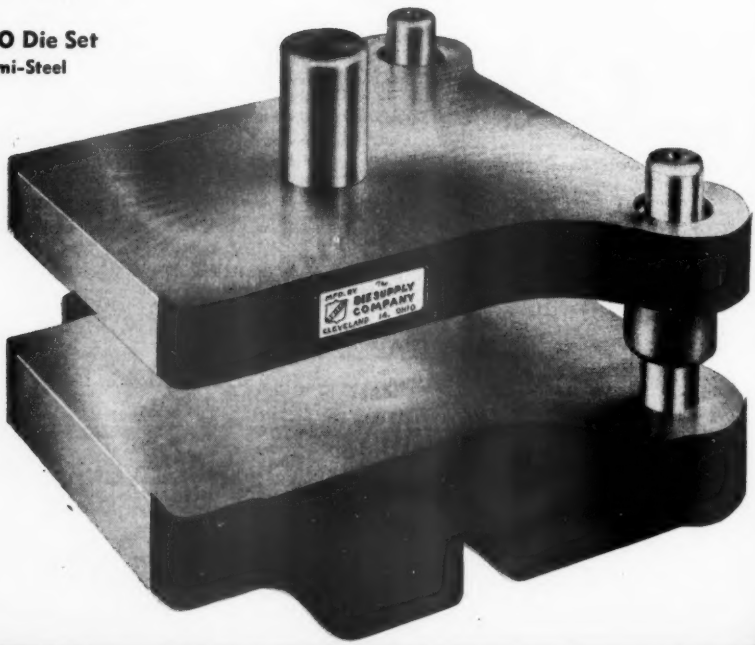
Demand DIECO

DIECO Die Set
Semi-Steel Punch Holder
Steel Die Shoe

DIECO Die Set
All Semi-Steel



DIECO Die Set
All-Steel

DIECO...Your Biggest Value in Die Sets Prompt Delivery on All Standard Sizes

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1728 Combinations
All-Steel Semi-Steel
special and standard

DIECO Guide Pins and Bushings
Precision, Commercial and Shoulder

DIECO Die Springs
500 Stock Sizes
3 pressures:
Medium, Medium-High and High

Performance is proof! Industry reports: "DIECO Die Sets are smoother operating—need no prybars. Mount dies quicker, easier. Longer die-life, even in toughest press runs. Less down-time saves man-hours." That's how DIECO finer craftsmanship pays off . . . protects your die investment, delivers better production, bigger profits. The reason: DIECO Die Sets are manufactured by The Die Supply Co. Greatest care in selection and inspection of materials, plus DIECO's own 24-hr. stress relieving provides the right foundation for accurate machining and finer precision finishing of working surfaces. Demand DIECO for *all* your tool, die and machine shop accessories. *Ask for catalogs.*

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DIECO

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PITTSBURGH 6: 122 S. Sheridan Ave. • EMerson 1-0440
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Why Wait for SPECIAL TAPS?

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HIGH SPEED [SPECIAL] RIGHT HAND TAPS

SIZE	THREAD
4	32-48-60-64
5	30-32-36-40-80
6	36-40-48-56-60
7	32-48
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	28-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40

SIZE	THREAD
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-48
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	8-11-12-14-16-18-20-24-26-27-28-32
13/16	16-14-18-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
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1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	18-20-24
1-5/8	5-1/2-8-10-12-13-16-18-20-24
1-11/16	10-12-14-16-18-20-24

SIZE	THREAD
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2 - 8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-1/2 - 8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	8
4	8-12

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32

SIZE	THREAD
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18

SIZE	THREAD
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1-11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4-1/2 - 10-12

- *SPECIAL AND LEFT HAND DIES IN STOCK*

Prices on Application. We are always adding new sizes

NOTE: Oversize - Undersize - Acme - Metric - 64th 32nd Size Taps - Available for Quick Delivery

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"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.

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INDIANAPOLIS	HU 5604
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MILWAUKEE	GL 3-7170
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MONTREAL, CAN.	WI 1186
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PHILADELPHIA	VI 4-4084
PITTSBURGH	LO 1-4011
ROCK ISLAND, ILL.	RI 8-2814
ST. LOUIS	FR 6811
SEATTLE	SE 7997
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DETROIT DIE SET CORPORATION

2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SET ★

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MALCUS CENTERLESS GRINDER

MALCUS Centerless Grinders, made in Sweden, are built to meet the accuracy, production, and versatility required by industry. In addition to in-feed and through-feed operations, these machines, with suitable attachments, can grind tapers or profiles.

CHECK THESE OUTSTANDING FEATURES:

- Strong and rigid construction.
- Adjustable grinding and regulating wheels for handling all diameters within full capacity of machines.
- Main spindle supported by long, plain bearing.
- Automatic, circulating lubrication system for main bearing.
- Feeds can be adjusted rapidly during grinding operation. Regulating wheel has individual drive and controls.
- Micrometer adjustment of regulating wheel and its dressing device provides for a higher degree of grinding accuracy.
- Marks on bars are eliminated by floating rollers on feed tables.

TYPICAL GRINDING RESULTS:

Straightened bars from 3/16" to 5/16" in diameter, with a stock removal of .010" to .020", can be finish ground in one pass at a speed of 25 to 30 feet per minute.

GRINDING CAPACITIES				
Type	MC2*	MC3	MC4	MC5
Largest Diameter	2⅜"	2⅜"	6"	6"
Smallest Diameter	.004"	.004"	.020"	.020"
Max. Length-In-feed	5⅞"	5⅞"	9⅞"	10-7/16"

*Type MC2 is designed mainly for in-feed grinding. Construction differs from other types.

Grinders can be equipped with regular and automatic bar feed tables, hopper feeds, or special feeding devices.

FOR COMPLETE DETAILS WRITE TODAY

COSA CORPORATION
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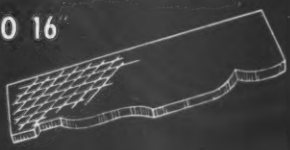
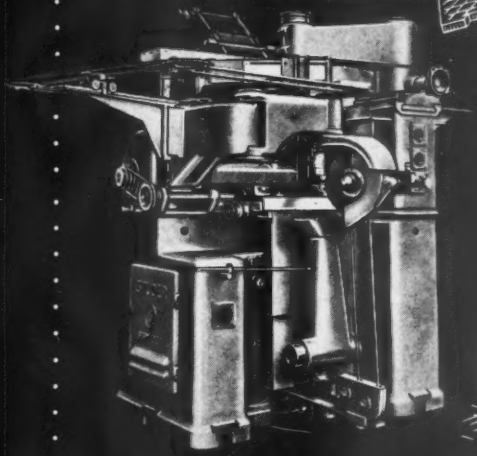
THE STUDER PSM-250

GRINDS PROFILES UP TO 16"

IN ONE SETTING

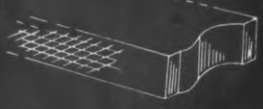




LARGER FLAT OR CIRCULAR FORM TOOLS, SECTIONAL DIES, GAUGES AND OTHER PROFILE PARTS CAN NOW BE ACCURATELY GROUND ON THIS

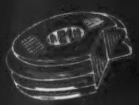
NEW STUDER

PROFILE GRINDER



INCREASED CAPACITIES
The PSM-250 grinds profiles up to 16" long in one setting and accepts flat work pieces up to 4" thick and rounds up to 10" diameter. Templates up to 24" long are easily accommodated. The adjustable pantograph can be set in any ratio from 1:1 to 1:10

CLEARANCE ANGLE AND RELIEF GRINDING
Attachments are available to grind different clearance angles on flat form tools—*without correcting template form*, and, to relief-grind punching and drawing dies



AUTOMATIC TRACER GUIDE
This attachment automatically guides tracer bar along the template. The automatic, uniform feeding produces improved surface finishes and increases the life of grinding wheels. To guide tracer bar by hand, two screws are loosened to detach the device.

PRECISE GRINDING
Profiles can be ground to a tolerance of ±0.0004". Closer limits are obtainable when large ratios of reductions are employed

WRITE FOR CATALOG ILLUSTRATING AND DESCRIBING THE NEW STUDER PSM-250

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16928 James Couzens Highway, Detroit 35, Mich.

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UNBRAKO CAP SCREW head and threads are strong

Controlled fillet and unbroken flow lines, following the contour of head and threads, eliminate the straight planes of weakness along which shear can occur. Consistently high tensile and fatigue strength, non-slip internal wrenching and fast, easy assembly with the knurled head are other UNBRAKO features that save time and money.

Write for descriptive literature. STANDARD PRESSED STEEL CO., Jenkintown 36, Pennsylvania.

Standard sizes, #4 to 1", are available from distributors' stocks.

SPS JENKINTOWN, PENNSYLVANIA

UNBRAKO SOCKET SCREW DIVISION CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

SWISS BLUE RIBBON PRECISION MACHINE TOOLS

Backed right here in the U. S. by skilled technicians, factory service and guarantee, and spare parts readily available from every Hirschmann Branch.

Typical as to precision and as to fame of trade name, Tornos R10 Swiss Automatic Screw Machine.

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Horizontal Micrometers • Optical
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CHUCKS
Keyless Drill
DIAMOND & OTHER ABRASIVE WHEELS
DIE SETS
DIE SINKERS
DRILLING & TAPPING MACHINES
FINISHING MACHINES
Precision
FORMING & CUTTING-OFF MACHINES
Automatic
GEAR HOBBING MACHINES
GRINDERS
Tool • Twist Drill
GRINDING MACHINES
Hydraulic • Hydraulic Cylindrical
Jig • Optical • Universal
INDEX HEADS
Universal
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JIG GRINDERS
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LATHES
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Cam • Production • Surface • Toolmakers
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For Watchmaking and similar industries
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TOOLS
Screw Machine-Carbide and High Speed Steel
TURNING MACHINES
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PRK-33—Air Hardening, Non-Deforming Cobalt, High-Carbon, High Chrome. For high production blanking, forming, drawing, trimming and shearing.

NEOR—The original Oil Hardening, Non-Deforming High-Carbon, High Chrome. Recognized as the ideal lamination die steel. Also suitable for other long run dies.

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OHT—Oil Hardening, Non-Deforming. Excellent machinability, minimum distortion, good resistance to wear. An economical steel for short run dies.

"MT 6"—The Standard "M2 Type", High Speed Steel. Designed for a superior tool and at the same time save critical alloys.

A Darwin tool steel, used in the manner recommended by our engineers, is the positive answer to tool steel troubles. Darwin carries a complete range of tool steels, each best in its class, each capable of performing an outstanding job. Check with us before you specify tool steels—we know it will be profitable for you.

Furnished in bar stock, billet, forging, sand casting. Drill rod, flat ground stock, tool bits. Bulletin on Request.

DARWIN & MILNER Inc.
highest grade tool steels
2345 ST. CLAIR AVENUE ★ CLEVELAND 14, OHIO

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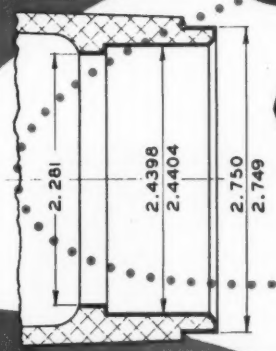
Microbore

PRODUCTION EQUIPMENT

Engineered and manufactured by

DEVLIEG



SURFACES MACHINED ARE INDICATED BY HEAVY LINES

Illustration shows Microbore cluster tools for machining seven surfaces on a main bearing housing at one pass. The Microbore system of tool adjustment permits fast set up and precise limits are maintained on production runs.

For the latest developments in precision tooling consult

DEVLIEG of DETROIT

DeVLIEG MICROBORE CO. 480 Fair Avenue • Ferndale 20, Michigan, U.S.A.

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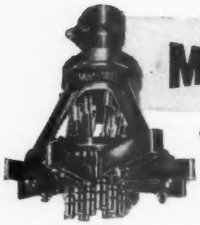
Commander PRODUCTION TOOLS

SPEED PRODUCTION...

LOWER COSTS



Adjustable MULTI-DRILL

- Adjustable To Any Hole Pattern
- Drill 2 to 8 Holes at 1 Stroke
- Fits Any Drill Press

Increase production up to 800%—save time, cut costs. Mounted without alterations or special tools. 9" drilling area; centers to ½". Extension Spindles available to increase area to 22½". Special adaptations available.

"The tapper that thinks for its operator"

Adjustable full range torque control instantly stops any tap when it's dull, loaded, strikes a hard spot, or bottoms in blind hole tapping. Assures maximum production, cuts rejects, even with inexperienced operators.

Commander TAPPER

- Wider Range . . . 1 Tapper Handles No. 0 to ¾" Taps
- Automatic Tap Protection
- Furnished to Fit Any Drill Press

DRILL CHIP BREAKER

- Drill SHALLOW or DEEP Holes up to 400% Faster
- Drill 10 diameters or more in depth without clearing drill
- Better, Smoother, More Accurate Holes

Ordinary Chips

Chip Breaker Chips

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Commander MFG. CO.

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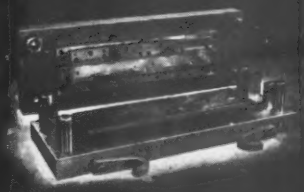

Completed die for blanking a Nash door component—built for longer die life in a Danly all steel 4-post special die set.

DANLY SPECIAL DIE SETS

Danly all steel 4-post special die set, 14" x 44".

help Nash meet close production schedules!

Dies play a big part in modern high-speed automobile production. They have to be ready on time when model changes are scheduled and they have to stand up under three-shift operation day in and day out with a minimum of down time. That's why you'll find so many Nash production dies built in Danly Special Die Sets. A Danly set means fast delivery to meet the tooling schedule and a rugged, precise base for the dies that assures maximum die life.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT —CALL YOUR NEAREST DANLY BRANCH

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***LOS ANGELES**	54	Ducommun Metals & Supply Co., 4890 South Alameda
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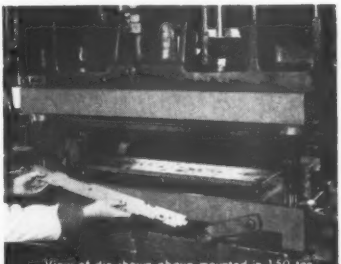
**Indicates complete stock*



View of die shown above mounted in 150 ton press at the Seaman Body Plant of the Nash-Kelvinator Corporation in Milwaukee, Wisconsin.

DANLY®

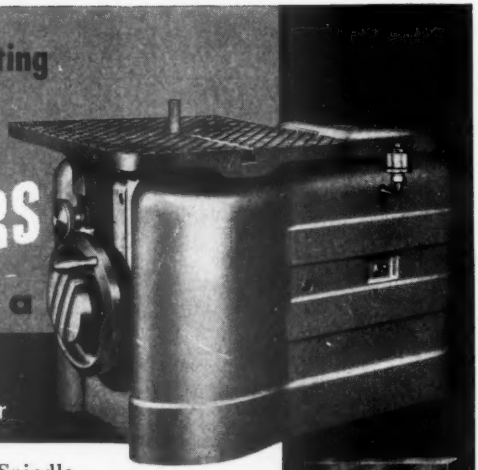
DIE SETS ... STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

grinding and fitting

DIFFICULT CONTOURS

is EASY with a

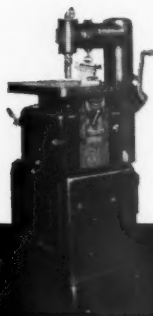
BOYAR-SCHULTZ
No. 1 Profile Grinder



A Bench model with Spindle speed of 20,000 R.P.M., Boyar–Schultz No. 1 Profile Grinder is a rapid Stock remover.

An ideal machine tool for grinding and fitting irregular inside and outside contours and profiles such as die clearances and other many grinding jobs that would otherwise require time consuming set-ups. A real time-saver, performing in minutes many jobs that formerly required hours.

Accommodates wheels ⅛″ to 1″ diameters.



Boyar-Schultz
No. 2 Profile Grinder

For grinding and fitting large dies and punches such as forming dies for refrigerators, tables, sanitary ware and other large work. Spindles turn at 10,000 R.P.M. Accommodates wheels ¼″ to 3″ diameters.

BOYAR-SCHULTZ CORPORATION

2112 Walnut Street • Chicago 12, Illinois

THREAD BROACHING
ENDS TAPPING TROUBLES

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Ultra Precision
THREAD-CUTTING BROACHES deliver these advantages:

- End tapping trouble.
- Produce threaded holes by a Shearcutting action.
- Are practically unbreakable.
- Ground from hardened high-speed solid blanks.
- Require only half the power needed for tapping.
- Have an amazing long life.
- May be resharpened many times.
- Feed the chips out of the hole.
- Lower production costs.
- Replace standard taps in most sizes.

SHEARCUTTER TOOLS COST LESS IN THE LONG RUN

These ultra-scientific cutting tools are used by practically every large manufacturing company in the U.S.A. Constant repeat orders prove their merit and value.

Patent Warning: All Shearcutter Tools are protected by U.S. and Foreign Patents, received, pending or applied for.

*ANOTHER AMAZING INVENTION OF RALPH GORDON FEAR

SHEARCUT TOOL CO.

MANUFACTURERS OF THE WORLD'S MOST SCIENTIFIC CUTTING TOOLS
7041-7045 Darby Avenue Dept. YP112 Reseda, Calif. (L.A. County)

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BARTH MULTIPLE SANDWICH DIES form FURNACE PIPE!

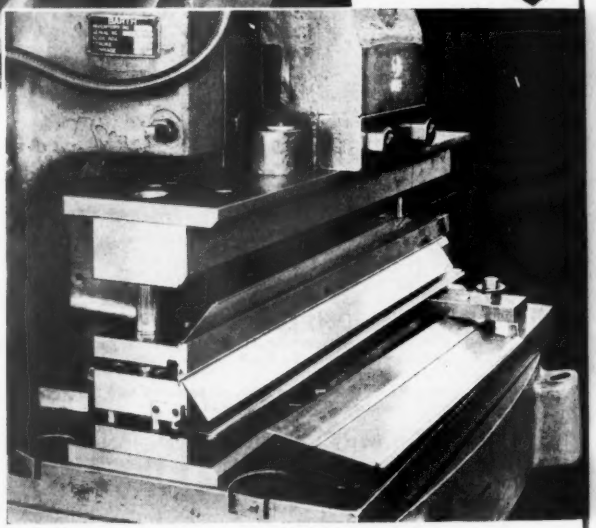
SEAM DETAIL

The seamed pipe is shipped flat and is speedily interlocked by hand on the job.

Two Dies Perform Five Operations

FIRST DIE forms the male seam in 2 blows

SECOND DIE forms the female seam in 3 blows



GOT A JOB YOU NEED DONE

faster...
better...
at less cost?

Bring it to Barths for a speedy, practical and profitable solution. A consultation with Barth engineers and designers entails no obligation on your part.

BARTH'S NEW PLANT

BARTH STAMPING & MACHINE WORKS

12650 Brookpark Road, Cleveland 29

DESIGNERS AND BUILDERS OF DIES, TOOLS AND SPECIAL MACHI

GOOD NEWS!

NOW-Grind Carbide Tools WITHOUT Diamonds

With Light Wrist-Pressure, under steady coolant flow, these BAY STATE wheels:

1. ***FINISH-GRIND*** **CARBIDE SINGLE POINT TOOLS.**
2. **CUT AS FAST AS DIAMOND WHEELS.**
3. **CUT COSTS TO A MINIMUM.**

IMMEDIATELY AVAILABLE FROM STOCK, these new BAY STATE specifications have been especially developed to help you meet the present and continuing diamond shortage.

TO KEEP PRODUCTION GOING
TO SAVE HARD-TO-GET DIAMOND WHEELS
TO KEEP CARBIDE CUTTING EDGES KEEN

Take advantage of Bay State's Advanced Engineering.

BAY STATE

ORDER A TRIAL WHEEL TODAY

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U.S.A.
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Distributors — All Principal Cities
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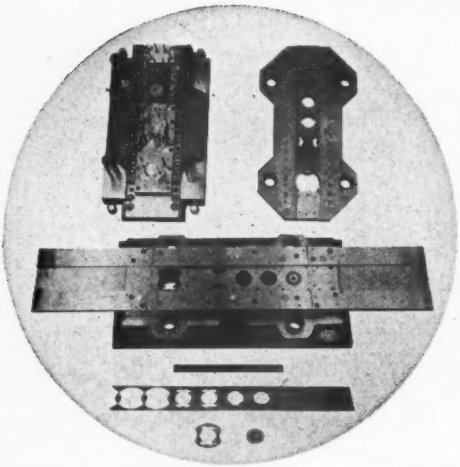
This die was not just "made"...
it was ENGINEERED



Just a choice of words, you say? No, it's more than that. The progressive steel lamination die shown here was hole-bored, hole-ground and contour-ground to pre-engineered dimensions entirely on Moore-built machines in the Moore toolroom. It exemplifies the application of *engineering* principles that put die-making on an interchangeable parts-and-assembly basis for the first time.

Let's take a close look at this die: All die sections are mounted in a hardened nickel-chrome frame for maximum production and die life; the die set was specially made by Moore. The spring stripper is guided on four main posts. High-speed inserts are set into hardened steel frames.

Moore produced all parts of the die *to figures instead of to "fit."* This was done concurrently by several toolmakers instead of progressively as a slow, one-man job.

Precision Hole Location and Contour Grinding Methods Assure Accuracy, Speed, Economy

THE NO. 2 MOORE JIG BORER bored all holes before hardening, thus holding the location as close as possible to eliminate excessive grinding. With its built-in system of accurate lead screws, the Moore Jig Borer can spot, drill, bore or ream all holes in a workpiece with minimum tool changes and to close tolerances.

No. 2 MOORE JIG BORER

Punches and dies of the first station—at the right in the photograph—were ground with a *Moore Panto-Crush Wheel Dresser*. This machine, which combines roll-crushing and diamond dressing, did the required linear contour grinding quickly and efficiently. *Moore Motorized Centers* handled several of the smaller grinding jobs.

WITH THE NO. 2 MOORE JIG GRINDER, all die sections were screwed and doweled into place, put on the machine and ground in *one* set-up. This eliminated separate section hole-grinding and the accompanying difficulty of accurately locating each section in the die bed. The Jig Grinder does the job in one-third the time required by previous methods.

To grind Stations 2, 3, 4, 5 and 6, the new contour-grinding and slot-grinding features of the Jig Grinder were utilized.

Die try-out and assembly operations were performed the modern, fast, "mechanized" way on the *Moore Die Flipper*.

No. 2 MOORE JIG GRINDER

End results? Moore equipment brings true interchangeability to the toolroom, lowers tool costs, increases toolroom capacity, prolongs die life and achieves greater accuracy.

Detailed bulletins on these machines are yours for the asking—today. Write to: Moore Special Tool Company, Inc., 726 Union Avenue, Bridgeport 7, Conn.

ADD MOORE TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS
DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

Inter-changeable cams and index plates for 1 to 14 flutes.
Inter-changeable collets up to 1.125" D.
Preloaded ball bearing spindle.
Easy-to-read settings. Easy to set up.
Base swivels for angular grinding.
Mounts on most grinder tables.

For . . . TAPS
STEP CUTTERS
BORING TOOLS
PROFILE MILLS
CENTER DRILLS
ETC.

What a relief!

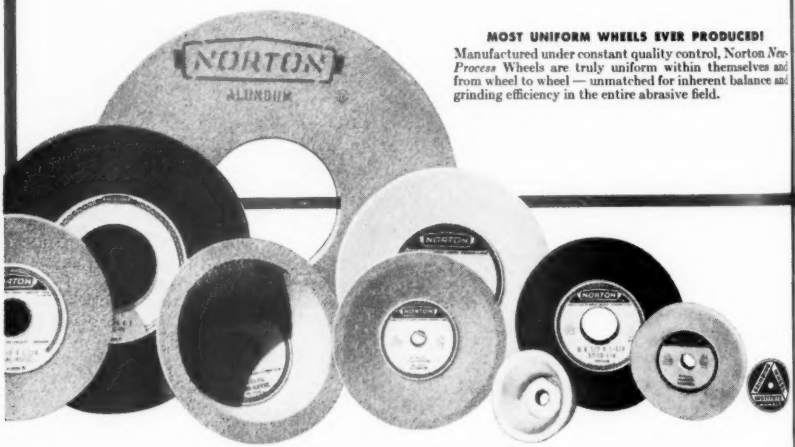
More Cuts Per Grind
Better — Freer Cutting

Reduce perishable tool costs with this preferred grind on your straight and spiral flute production cutters — Easy and fast as ordinary angular relief grinding.

D·S GRINDER DIVISION
ROYAL OAK TOOL & MACHINE CO.
621 E. Fourth St., Royal Oak, Mich.

D·S
RADIAL RELIEF GRINDER

See how Norton New-Process Wheels bring new efficiency... new economy... to your toolroom grinding



MOST UNIFORM WHEELS EVER PRODUCED!

Manufactured under constant quality control, Norton *New-Process* Wheels are truly uniform within themselves and from wheel to wheel — unmatched for inherent balance and grinding efficiency in the entire abrasive field.

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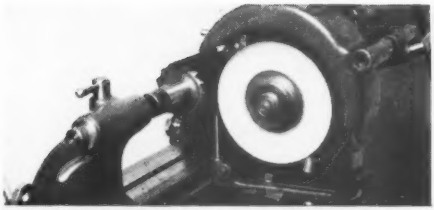
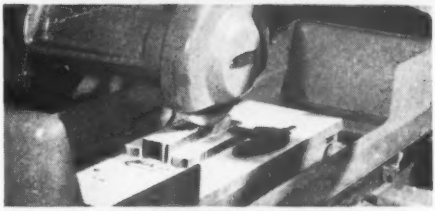
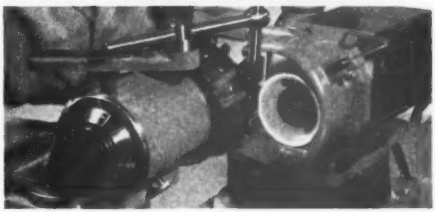
You get:



IMPROVED GRINDING OPERATION. The more uniform structure of Norton *New-Process* Wheels assures even wear. That means fewer machine adjustments and longer wheel life. And you can count on identically marked wheels for identical top performance.



IMPROVED RESULTS. You can grind to closer tolerances and smoother finishes with *New-Process* Wheels. Vibration is reduced and chatter marks are eliminated — thanks to their built-in balance that lasts for the entire life of each wheel.



IMPROVED TOOL MAINTENANCE. With Norton *New-Process* Wheels you can take heavier cuts on expensive high-speed steel and cast alloy tools without drawing tempers or risking spoilage. Tools stay sharp longer — and last longer — for added savings in toolroom operating costs.

AVAILABLE IN A RANGE OF ALUNDUM* ABRASIVE TYPES

New-Process Wheels are made in various types of fast cutting, cool cutting ALUNDUM (aluminum oxide) abrasive — Regular ALUNDUM, 19 ALUNDUM, the new and outstanding 32 ALUNDUM, 38 ALUNDUM, 57 ALUNDUM — for best results in every toolroom application, from general grinding to high precision work. *New-Process* ALUNDUM Wheels (made in sizes up to 14") are also ideal for many other grinding jobs on hardened steel and materials of high tensile strength.

162 Pages Of Cost-Saving Facts on toolroom grinding are contained in this booklet. Get a copy from your Norton Distributor or write direct for Form 835.

YOUR NORTON DISTRIBUTOR CAN SAVE YOU TIME AND MONEY

There's no room for guesswork in grinding wheel selection. Your Norton Distributor *knows* which type and size of wheel is best for each job. And if your problems are unusual, he'll call in a Norton Abrasive Engineer for additional expert advice. See him for exactly the *right* Norton Wheel for *any* grinding operation.

NORTON COMPANY, Worcester 6, Mass.
Warehouses in 5 cities. Distributors in all principal cities.
Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

NORTON
ABRASIVES
Making better products to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

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USE HARIG precision die

For TOP production

Proven . . .

- LESS DOWN TIME
- LOWER COST PER PIECE
- PRECISION WORKMANSHIP
- GREATER PRODUCTION
- LONGER DIE LIFE

ELIMINATE production bottlenecks caused by premature die wear and breakdowns! You too can change to HARIG tools and dies and save thousands of dollars as have many leading manufacturers. Consult our engineering staff — experienced in designing and building dies for every purpose — regarding your current die demands.

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for your free copy of
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HARIG MANUFACTURING CORPORATION
5761 West Howard Street, Chicago 31, Ill.

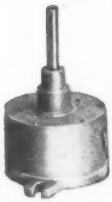
Cut Costs with MEAD AIR PRESSES

PNEUMATIC WORK FEEDERS

AIR CYLINDERS

AIR VISES

Besides the standard, ready-made fixtures for the application of Air Power (such as the Air Press, Air Vise, Air Chuck, Air Clamp), Mead offers a wide selection of air cylinders, which can be used in special jigs and fixtures. Illustrations show four types of double-acting cylinders, which can be furnished in five different bores with optional length of stroke.

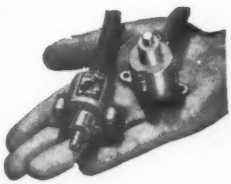


SINGLE ACTING AIR CYLINDERS

Use Mead Air Power

Get faster, more economical production set-ups—investigate the entire "family" of Mead Air-Operated devices. Hundreds of progressive factories now use them to do better, faster, more economical jobs. Do you want to move things—lift them, slide them, tilt them—or hold them firmly? Mead Air Power will do it. Do you need a delicate, flexible touch—or tremendous pressure? Mead Air Power has them both. If you are interested in saving time, money and man-power now and for the future, investigate Mead Air-Operated devices now.

**PNEUMATIC CYLINDERS*



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Send for copy of our new Air Power Catalog illustrating, describing many new man-and-money-saving devices.

MEAD
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4114 No. Knox Ave., Dept. HA-112, Chicago 41, Ill.

Announcing

the New Revolutionary

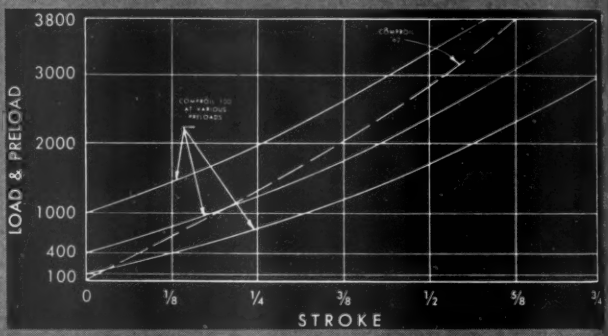
WALES

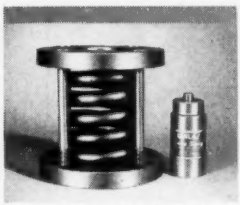
*Hydra-Spring**

With Up to 600% More Pressure

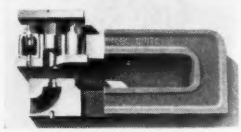
(Patents applied for)

*TRADEMARK

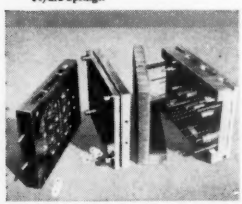




The small, compact Wales Hydra-Spring delivers as much spring pressure as the big, heavy railroad car coil spring.



Showing cutaway view of Wales Type "HS" Hole Punching Unit for punching and stripping *material* up to ⅛" thick. The heart of the Wales Type "HS" Hole Punching Units is the pair of Wales Hydra-Springs.



Showing a group of Wales Hydra-Springs in a plastic ejection mold die.

*TRADEMARK

● Wales Hydra-Springs SOLVE THE AGE OLD STRIPPING PROBLEM by providing *much greater* stripping pressure than the ordinary coil springs of similar size. In addition to simplifying die design and die making, *Wales Hydra-Springs make possible die operations that were previously impossible.*

For the first time, stripping pressures may be adjusted by simply adding or reducing the volume of SPECIAL COMPRESSIBLE FLUIDS KNOWN AS WALES COMPROILS. The above graph dramatically shows the extra high pressure characteristics of the revolutionary Wales Hydra-Springs using various Wales Comproils, strokes, loads and pre-loads.

Yes, there is always something new in the Wales Line. This time it is the three models of Wales Hydra-Springs. It is too big a story to tell here so write TODAY for complete information.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

355 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

Lower unit costs are yours with Dickerman. Assuring longer die life and fewer regrinds, Rol-di-Feed operates accurately and automatically — greatly reducing the number of blanks and rejects encountered in what is now your standard production set-up. This all adds up to Dickerman Die Feeds doing work equivalent to five workmen.

Write for detailed information today

H. E. DICKERMAN MFG. COMPANY Dept. K323 Albany Street • Springfield, Mass.

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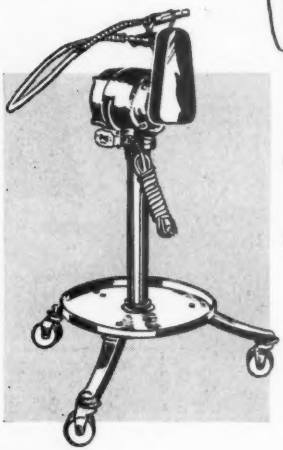

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FINISH!

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FLEXIBLE SHAFT TOOLS

SEND FOR BULLETINS!

Complete bulletins and operating data are quickly available. Send today, stating your particular production problem. Use the Coupon.

Whether you're finishing a casting, a weld, a fine die or stainless steel surface, you'll get the equipment that will do the job best from the best-known name in flexible shaft equipment—Haskins. Here is a company with a world of finishing experience to offer you—and a line of flexible shaft equipment in which long-life, multiple usefulness and economy have never been sacrificed to price.

R. G. HASKINS COMPANY 2647 W. Harrison St., Chicago, Ill.

Send data on Haskins equipment for_____
(state operation)

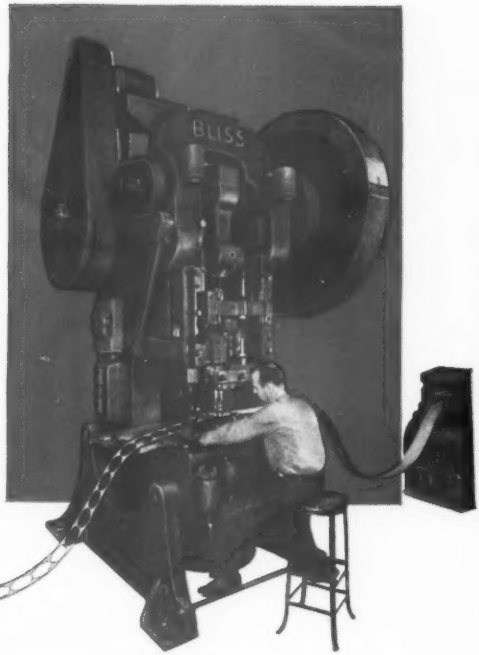
Name_____

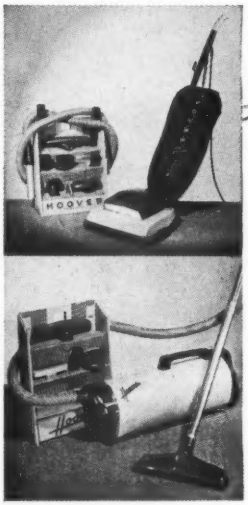
Firm Name_____

Street address_____ City_____ State_____

Bliss...

The Presses That Outsell All Others Dominate Hoover's Press Room, Too...





Punch presses must be versatile to produce the range of metal stampings needed for Hoover Company's famous upright and tank-type vacuum cleaners. They must be rugged, too, to withstand the hard usage demanded by heavy production schedules. That's why Bliss Inclinables dominate Hoover's press room...represent 90% of the stamping equipment at the North Canton, Ohio, plant. As Hoover's press room superintendent puts it, "Even the oldest of our Bliss presses works perfectly; maintenance for all twenty-six is negligible."

More than 50,000 Bliss Inclinable Presses are now serving industry. And despite heavy demands for these presses, Bliss' expanded facilities make it possible to provide early deliveries of certain sizes. Your local Bliss sales engineer can give you full information.

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E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

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EARLY DELIVERY OF CERTAIN SIZES

From a single press for a given job... to a complete press room...

It's Bliss

HARDINGE-SJOGREN

HARDINGE
ELMIRA, N.Y.

SPEED

Collet Chucks with
HARDINGE STEEL COLLETS

Available in Five Sizes:
1", 1⅜", 1¾", 2¼", and 3½" collet capacity.

for Accuracy and Durability at Low Cost

When you order Hardinge-Sjogren Chucks and Hardinge **Steel** Collets you get all these advantages:

1. Complete Capacity for Hexagon and Square as well as Round.
2. Lowest Initial Cost.
3. Longest Service Life.
4. Grips both **short** and long lengths properly.

. . . . . and HARDINGE tempered steel collets assure you of quick release, sustained accuracy and durability.

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HARDINGE-SJOGREN Chucks and Collets.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

SPEEDS UP OPERATIONS IN TOOL ROOMS
. . . ON PRODUCTION LINES

DREMEL—*Electric* MOTO-TOOLS

DOES THESE OPERATIONS BETTER-FASTER:

GRINDING
DRILLING
BURRING
POLISHING
DRESSING
SHARPENING
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ELECTRIC DREMEL POWER TOOLS

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APPROX. 27,000 R.P.M.

MOTO-TOOL KIT NO. 2 contains 23 accessories, including high-speed steel cutters and Model 2 Moto-Tool in natural finish hardwood case ——— $23.50

MOTO-TOOL No. 2, with one emery wheel point ——— $16.50

Dremel HIGH-SPEED STEEL CUTTERS and balanced wheel points are available for all makes of hand grinding tools. Write for literature.

"THE POCKET-SIZE MACHINE SHOP"

Dremel Moto-Tools are time tested—have been widely used in industry for over fifteen years. A veteran of World War II, Moto-Tool served in war plants and at military maintenance bases throughout the world. Thousands of these mighty midgets helped to make the atomic bomb—were used to establish production records in defense industries during the last war. Hundreds of toolroom and production line operations, such as polishing and grinding dies, burring parts, marking tools, sharpening cutters, touch up jobs, etc. are accomplished in seconds, **without tearing down "set-ups."** Moto-Tool is sturdily constructed for long lasting industrial service. Weighs only 13 oz.—dynamically balanced for vibration-less operation.

DREMEL MFG. CO. Dept. 522-L **RACINE, WIS. U.S.A.**

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Metallic Cutting Off...

Abrasive Cutting Off Wheels by CARBORUNDUM are from 12 to 20 times faster than steel saws, on all kinds of metals—produce smoother, more finished, better quality cuts than you can get with flame cutting or shearing—and they do the job at lower overall cost than conventional methods. Rubber bond wheels as thin as five thousandths—resinoid bond wheels as thin as 1/32"—"MX" wheels as thin as 3/32"—there is a wheel by CARBORUNDUM for every high speed production operation in your shop.

ORDER FROM YOUR CARBORUNDUM DISTRIBUTOR TODAY. He's your best

operation in your shop.

ORDER FROM YOUR CARBORUNDUM DISTRIBUTOR TODAY. He's your best bet for complete stocks, prompt delivery, experienced counsel on latest developments in the field. You'll find him listed in the yellow pages under "Abrasives." Phone him today—it's to your profit!

THE CARBORUNDUM COMPANY, DEPT. TP 81-82
Niagara Falls, New York
Please send me, FREE, your booklet No. 6, "Metallic Cutting Off with Abrasive Wheels."

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offers ALL abrasive products . . . to give you the proper ONE

"Carborundum", "Aloxite" and "MX" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York

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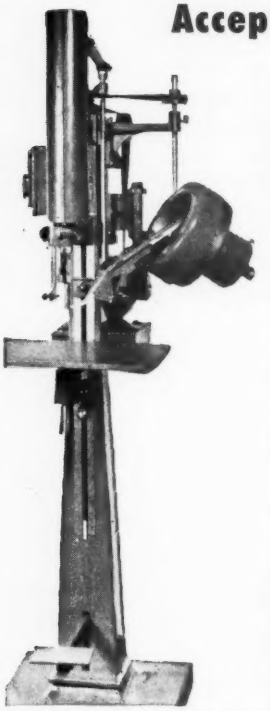
Yes, We Can Do It!

We Can Quote on Your Application, Accept Your Order and DELIVER



We are in an enviable position whereby we can deliver the answer to your assembly problem in the form of a particular piece of equipment designed especially for your needs . . . We can do it NOW—not maybe—some time in the future. Though generally speaking, deliveries throughout industry are uncertain, and this situation probably may continue for some time, our position is different . . . We have marshalled our resources and facilities in a way whereby we can positively assure the execution and delivery of your orders without delay.

DETROIT POWER SCREWDRIVERS, HOPPER FEEDING UNITS

NUT DRIVERS, SPECIAL ASSEMBLING MACHINES

Thousands of manufacturers have profited through greatly stepped-up production as a result of our service. You, too, can benefit by the use of D. P. S. power-driven machines. Get further details. Also send sample assembly for production estimate.

DETROIT POWER SCREWDRIVER CO.

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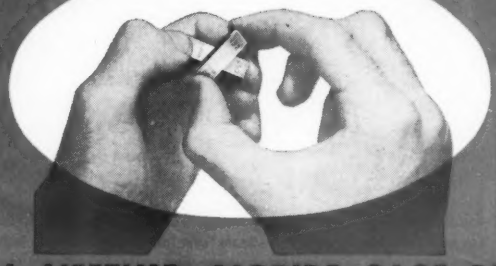
acclaimed
for permanent precision



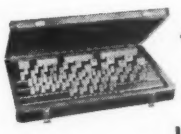
FONDA LIFETIME-CARBIDE GAGE BLOCKS

With more than 100 times the wear of steel and highest corrosion resistance, Fonda Lifetime-Carbide Gage Blocks need never be replaced or recalibrated under normal usage. Acclaimed by leading manufacturers in the metal-working industry — and many others — who must have permanent precision. The unsurpassed excellence of Fonda Lifetime-Carbide Gage Blocks is further confirmed by the National Bureau of Standards.

FONDA "ULTRA-FINISH" STEEL GAGE BLOCKS — for applications requiring less wear and corrosion resistance — are made from a carefully selected grade of high-carbon tool steel which has properties for high hardness, dimensional stability, and wear resistance.

"ULTRA-FINISH" gives superior flatness and surface finish to all Fonda Gage Blocks. This exclusive machine-lapped finish makes possible effortless wringing and unbelievable adhesion. Wringing is done with the blocks clean and dry, eliminating surface films that produce errors.

Write for the new 1952 edition of our catalog: "Precision in Millionths."



82-piece set rectangular

82-piece set square

FONDA

GAGE COMPANY, INC.

59 Daly Street, Stamford, Connecticut

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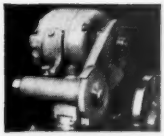
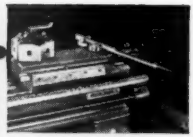

External Grinder

Milling Attachment

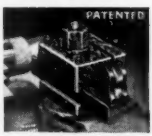
Handlever Tailstock


Handlever Bed Turret

Telescopic Taper Attachment

Handwheel Collet Attachment

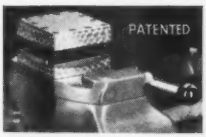
Handlever Collet Attachment



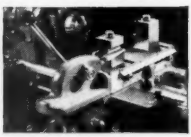
10 in 1 Tool Holder

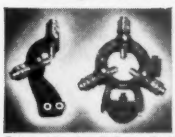
Ball Bearing Live Center

Adjustable Collet Bushing Chuck

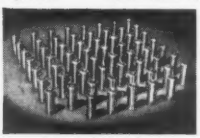


Square Turret Tool Block


Handlever Double Tool Cross Slide


Telescoping Jaw Follower Rest and Center Rest

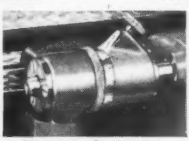
Collet Rack

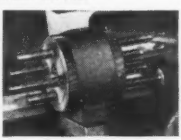

Steel and Brass Collets

Step Chucks and Closers

Centers and Drill Pads

Thread Dial Indicator


Micrometer Carriage Stop


Four Position Carriage Stop

SOUTH BEND
Lathe Attachments

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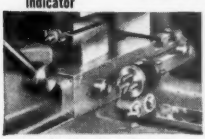
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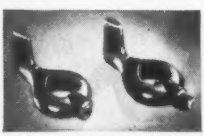
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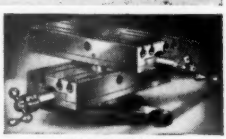
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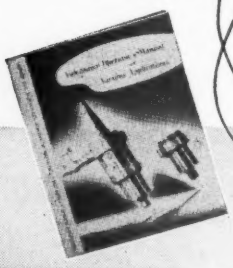

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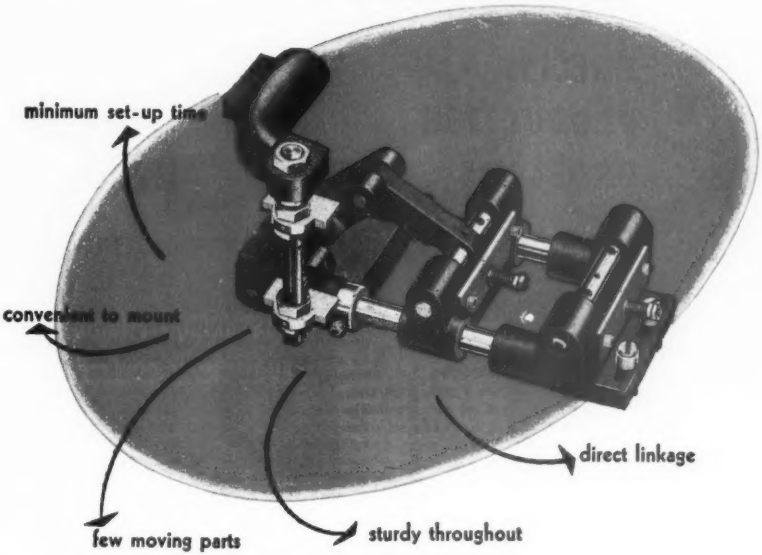

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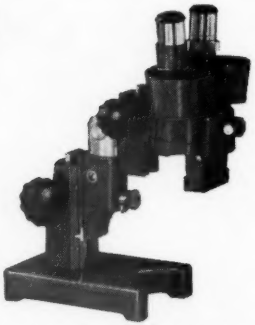

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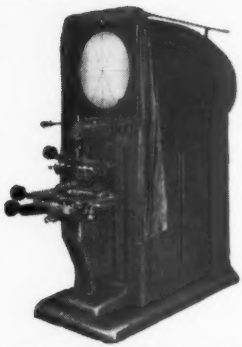

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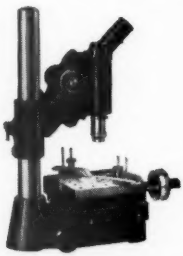

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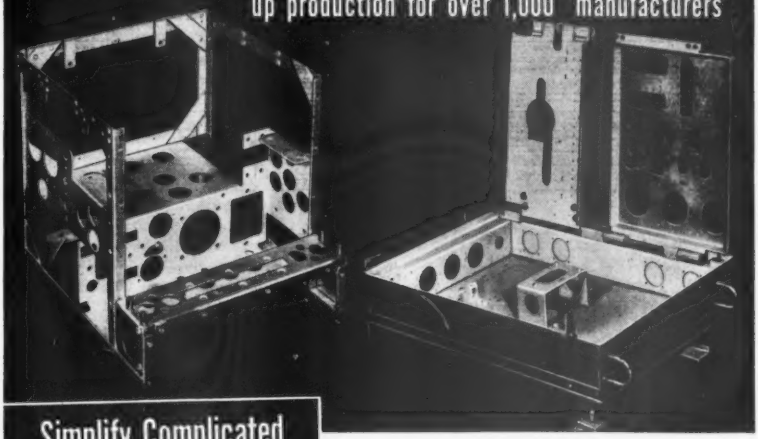

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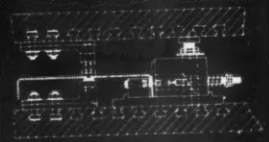

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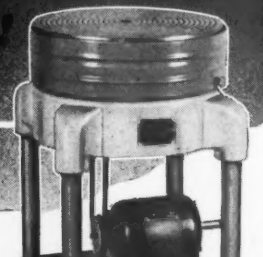

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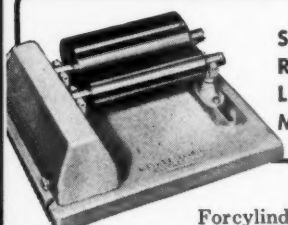

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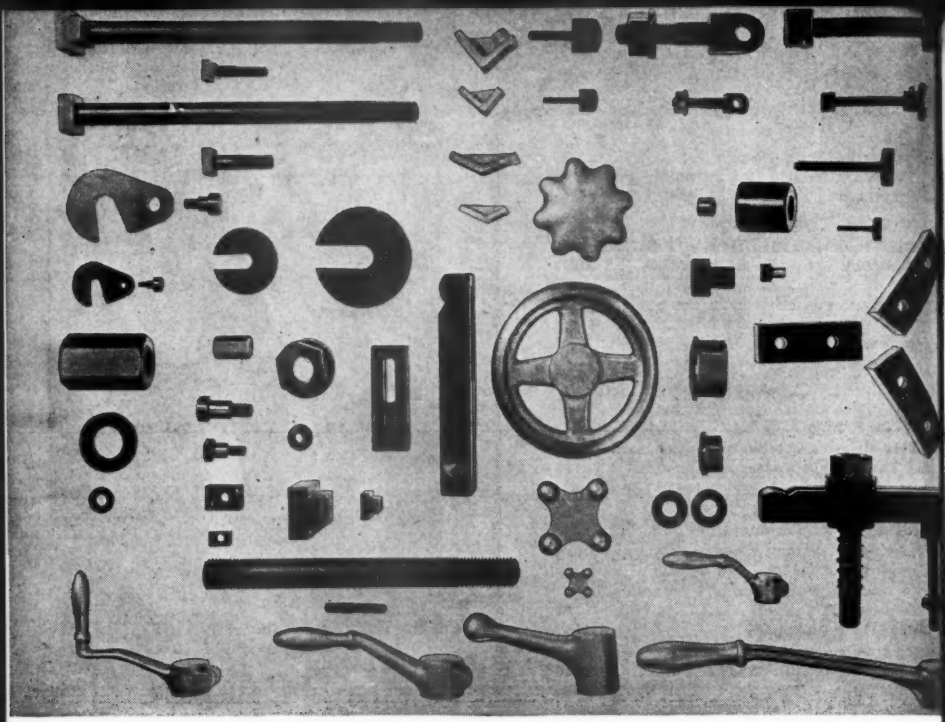

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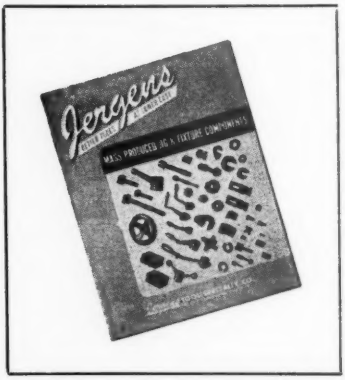

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editorial

quality control and automation

The mutual dependence that exists between quality control and automation is becoming increasingly evident as these two production techniques come to enjoy more and more widespread applications to industrial productivity.

To further substantiate this brief resume of the two is in order.

Quality control with all its ramifications is our most advanced development in the economic specificational control of high production, interchangeable, manufacture.

Automation, in all of its varying degrees of attainment, is the most highly developed form of mechanized production. As the most advanced state of the art is reached it will make obsolete the familiar term, "floor to floor" in relation to machining operations. Automation embraces the production picture from receiving dock to shipping platform.

Quality control covers form, substance and appearance, and has to do with physical dimensions, material specifications, analysis and acceptance, as well as surface finish, both mechanical and visual. There are appropriate measuring tools and gages for determining the extent to which manufacturing specifications are met: scales, calipers and projectors for form, shape or position; spectroscopes, metallurgical microscopes, and chemical techniques for analyzing substance; and mechanical and optical tools for measuring surface finish, wearability and color.

As production processes have become more and more mechanized in the trend toward automation, the measuring and gaging functions have been hard pressed to keep pace. As workpieces are produced on a hand turret lathe, 100% inspection can be employed without necessarily adding to the over-all production time. But, when it comes to the rate at which workpieces come from an automatic screw machine, 100% inspection on a piece by piece basis governs the end rate of production rather than the machine; so the full advantage of the automatic machine is lost.

That is why such inspection has become subject to the quality control methods dealing with batches and fractional sampling in accordance with proved statistical procedures. Thereby the control of quality catches up with production.

As productivity increases through further mechanization of the loading, unloading, and transferring of workpieces between machine stations, the inspection and control functions have to be engineered to meet the new demand load.

This is being done today through the application of electronics and optics to mechanical devices. In an automation setup involving, for instance, a workholding fixture which automatically rejects oversize workpieces we have an example of inspection rate catching up with production.

As metalworking production techniques advance, control and inspection tools will be further mechanized and integrated into the actual machine stations. As the production operations are made more continuous and automatic, the controls which insure uniformity will be made more positive; acting within narrower limits and with greater sensitivity in order that producton be uninterrupted.

Thus will quality control and automation become so closely allied as to approach the chemical world's continuous process industries where, for example, pipeline crude from afar flows into a refinery and emerges as a finished product for delivery to your neighborhood filling station. The highly automated process of gasoline manufacture is constantly policed by the instruments of measurement and control to insure continuous production and quality.

The total integration and mutual dependence that must exist between quality control and automation savors of the old and unanswerable question: which came first, the chicken or the egg?

E. Willard Pennington

editor

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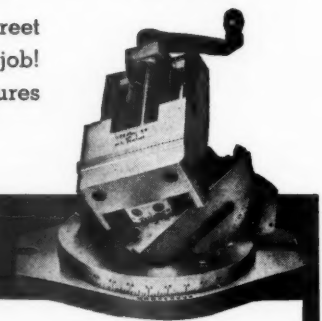

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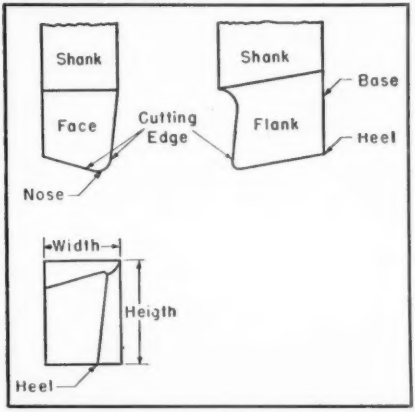
Manufacture of Tipped Tools

The use of cemented-tungsten-carbide or high-speed-steel tips on tool shanks has become common in industry, due to many advantages inherent in hard alloy tip materials and the obvious economy of using less expensive materials for the shank. Tips may be attached to the shanks by brazing. Many satisfactory sources of heat are available for performing this operation; however, the most common are furnaces, induction heaters, and gas torches.

by **E. J. Weller**
Works Laboratory
GENERAL ELECTRIC COMPANY
Schenectady, New York

The type of heat source selected depends upon many factors. Among them are quantities involved, design of tools to be tipped, labor available, and labor cost. It is not the purpose of this article to discuss these factors, but rather to outline the steps to be followed and to show the results which may be obtained when induction heating is used. For the sake of simplicity, this discussion will be confined to single-point tools, but the procedures outlined are equally applicable to multipoint tools. Figure 1 illustrates a typical single-point tool and carries the nomenclature which is used.*

Fig. 1. Single Point Tool



Basically, the manufacture of single-point tools follows these steps:

1. Design
2. Select tip and shank materials
3. Prepare tip and shank for assembly
4. Assemble tip and shank
5. Finish the tool (grind, etc.)

Only items 3 and 4 will be considered here.

A further classification of the preparation and assembly steps may be made as follows:

Preparation:

1. Sizing of the tip
2. Cleaning of the tip
3. Application of brazing medium and flux to the tip
4. Cutting the shank to size
5. Providing tip seat in the shank
6. Cleaning tip seat in the shank
7. Applying brazing medium and flux to seat

Assembly:

1. Physical assembly
2. Heating
3. Cooling
4. Cleaning

Preparation

Tips to be used in the manufacture of cemented-carbide-tipped tools usually are received from the vendor in such condition that only minor operations are required to prepare them for use. It is extremely important, however, that these operations be done properly to assure success.

The usual machining of the cemented carbide tips by the tool manufacturer consists of "breaking" the sharp edges of the tip along the margin of the seat surfaces. Grinding of the tip's seat surface to assure proper seating on or in the shank is required if it is found that this surface is not flat. Figure 2 illustrates the condition which may arise if the sharp corners are not "broken". Figure 3 shows a cross-section through typical tips which require grinding of the seating surface.

Non-parallel mating surfaces will result in excessive braze thickness and consequent joint weakness. Various tabulations of joint strength versus clearance have been published; these illustrate the

*A.S.A. B5.22—"Single-point Tools and Tool Posts", 1950.

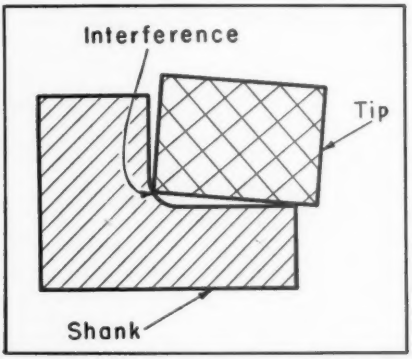


Fig. 2. Interference at Corner Between Tip and Shank

importance of maintaining correct spacing between tip and seat if satisfactory results are to be obtained. (For example, see ASTE handbook, First Edition, page 1167, figure 80-4).

Most of the tips manufactured today are cleaned by their producers. Nevertheless, all tips should again be cleaned carefully just prior to use. This is necessary to remove any oxide which has developed, as well as any dirt, grease, or oil that the tips may have picked up during storage or handling. (Even an oily fingerprint on the brazing surface may be the cause of a poorly-brazed joint.) Cleaning may be accomplished by grinding with a silicon carbide or diamond wheel, or by blast cleaning with silicon carbide grit. (Sand is not satisfactory for blast cleaning since the silicon which is deposited is detrimental. Also, steel grit is unsatisfactory because it will not remove surface oxide from cemented carbides). Blast cleaning is faster and somewhat more fool-proof than grinding, and is less likely to leave an oil film on the tip surface.

Tips made of high-speed-steel usually require more operations, since this material is generally purchased as bar stock. The tips are prepared either (1) by machining to size, cleaning, finishing, and then being left in the annealed condition, or (2) by hardening by conventional methods after machining and then cleaning and sizing as for cemented carbide tips. Whether to tip the tool with high-speed-steel tips which have been previously hardened or to use annealed tips and combine the hardening operation with the brazing operation is a matter of choice. Either method, when properly done, will yield satisfactory results.

Preparation of the shank is the same whether carbide or H.S.S. tips are to be applied. The tool shank must be cut to length and the tip seat prepared. Figure 4 shows four different types of seats, any one of which is satisfactory.

Figure 4a illustrates the simplest and least expensive method of preparing the shank. This type requires only cutting the shank stock to length. The tip is then attached to either the top surface or side of the tool shank. Disadvantages in this type of preparation arise from the fact that unless suitable fixtures are made to hold the tip while joining, it often is difficult to locate the tip properly. In addition, most tool-holders or tool-posts are designed to take tools made from standard bar-stock sizes; thus, tips set on top of the shanks will have their cutting edge above the center-line of the

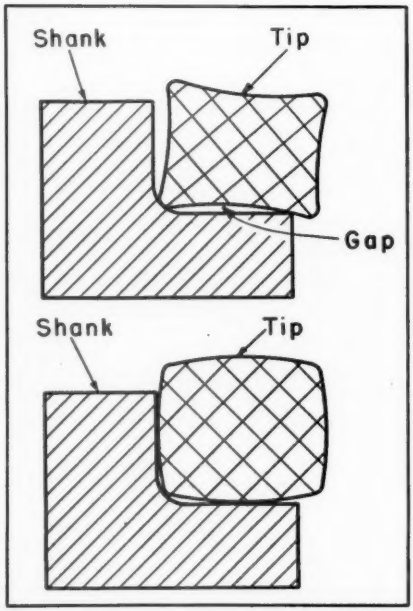


Fig. 3. Tool Tip Distortion Occasionally Encountered

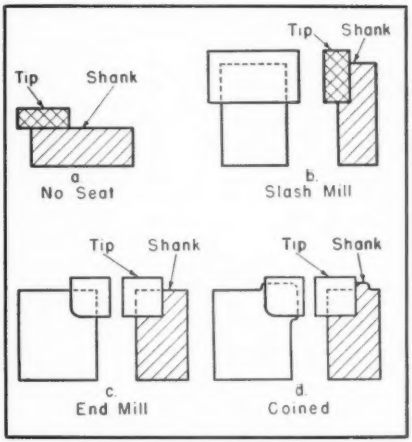


Fig. 4. Types of Shank Seats for Brazed-In Tips

work. This latter difficulty may be remedied by using smaller shank stock, the shank height being reduced by an amount equal to the thickness of the tip. Of course, this disadvantage may also be overcome if the tips are attached to the side of the tool.

Figure 4b shows a slash-milled seat which is relatively inexpensive to machine. This type of seat also causes some difficulty in locating the tips while joining if suitable fixtures are not used, but overcomes the problem of tip-to-work-centerline alignment.

The end-milled recess shown in Figure 4c is the one most commonly used at present, but it is also the most expensive to prepare. This type of seat is of great aid in locating the tip on the shank while brazing.

A coined seat is shown on the tool in Figre 4d. The coining method provides a rapid means of making seats and the amount of material available to support the tip is increased. Furthermore, for the first few grinds, there is a smaller volume of shank steel to grind away. The shanks to be coined may be heated satisfactorily by using an induction heater.

The cleaning procedure for the shanks should be the same as that outlined for the tips. If desired, however, steel grit may be used in place of silicon carbide grit, but it usually is simpler to use the same blasting material for both tips and shanks.

Once the tip and shank are cleaned, they should be assembled as soon as possible. While either or both of the parts are sometimes washed with alcohol, this operation may do more harm than good since it provides another source of contamination.

The brazing mediums used are of two general types. The first of these are the silver solders, which are used to the

(Continued on page 158)

Fig. 5. Left, tool shank seats being sprayed with braze metal. Right, tool tips which have been sprayed with braze metal while being held on magnetic chuck.

Increasing Productivity in a Large Screw Machine Program

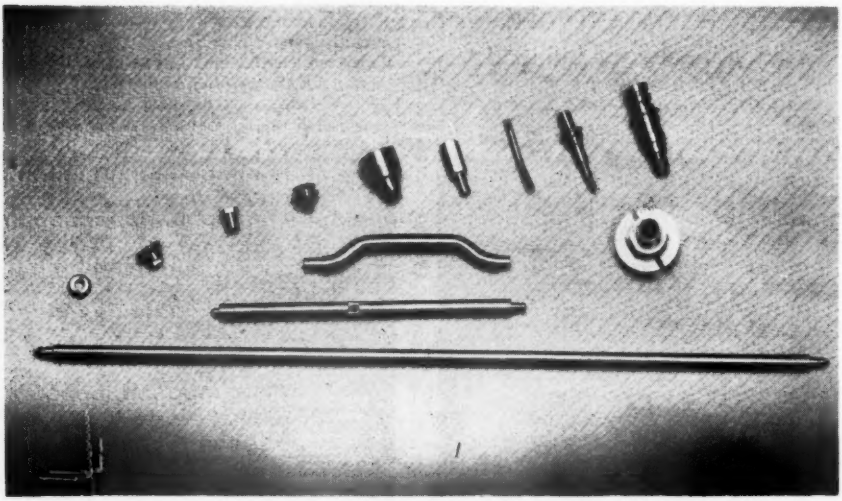
In a large screw machine program, producing many diversified parts in large quantities, the problems of production differ somewhat from those of the average jobbing shop or even from those of the average small shop in high production. Greater attention must be given to conserving man skills, while increasing machine and operator productivity.

by **D. J. Crombie**
Assistant Works Manager
UNDERWOOD CORPORATION
Hartford, Connecticut

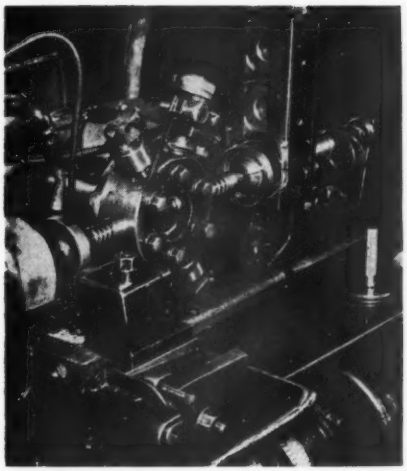
Here at Underwood Corporation, we have a large and varied screw machine program. The entire operation comprises three divisions. The largest, consisting of 300 automatic and hand screw machine units, is located at our Hartford Works. We also have some 70 units at our Greenwoods Plant in New Hartford, given over to the production of Portable typewriter parts. And, approximately 60 additional units are given over to Standard typewriter parts manufacture at our other satellite plant in Southbridge, Mass.

Our screw machine operation is to all intent and purposes nearly as self-sufficient as one department in a shop can be. As we have organized it, the division is more than a manufacturing department. All screw machine engineering is carried on within the department, under supervision of the division head, by men who work exclusively on this branch of tool and cam design. The manufacture and maintenance of all screw machine tooling is also carried on within the department. To handle this work, a small but well-equipped toolroom is provided. The division employs its own maintenance machinists, who take care of all the maintenance and service required on machine tool units and related equipment.

We have both old and new screw machines working side by side. A regular



These few samples are produced automatically on screw machines equipped with standard and special attachments. Finished parts are turned out with precision, high finish, and corresponding savings through elimination of secondary milling, bending, broaching, polishing, threading and many other operations which would be necessary without these specialized tools.



No. 2 B&S with Special Magazine for handling a secondary operation on a blanking job. Auxiliary cam on side of lead cam controls feeding. Magazine extends 6½ feet vertically on machine, and is hinged to facilitate loading. Work is held by special oversize collet and sleeve with ejector. Machine is double cammed to save index time.

replacement program is in effect; but, this program must be visualized in terms of what our screw machine specialists have been able to do with some of the older units. Whereas the newer units are devoted principally to diversified production, the older ones have received special attention and have been revamped for high speed and specialized jobs.

With the exception of several defense jobs, the screw machine facilities are entirely utilized in the manufacture of our own product — Standard, Electric and Portable Typewriters. By and large, the manufacturing operation consists of repetitive runs on many diversified types of parts. Our production problems, therefore, are somewhat different from those of the jobbing shop, although orders ranging in size from 5 pieces to 2,000 pieces per run are received. In general, regular runs cover approximately 1500 regularly scheduled parts, plus several hundred special and service parts.

In an automatic department of this type, a large capital investment in machinery, equipment, floor space, and so forth is to be expected. The greatest production per unit of investment is necessary in order to make possible and to justify further capital expenditure.

Machine Grouping

Fast turnover of materials and work in process is most essential to keep production and assembly lines moving, in addition to keeping inventory as low as possible. In order to achieve and to control attainment of these results, machines and parts are grouped according to design and manufacturing characteristics with special attention being given to part shape and contour. Batteries of machines are grouped to handle these various part classifications. In this manner, setups are held to a minimum and progressively arranged so that it is possible to make only partial tool changes instead of a complete new setup at the time of changeover from job to job.

Further, to help realize these results, the operator assigned to a battery of machines normally has one machine on short runs and the balance of his machine group on larger or steady production jobs.

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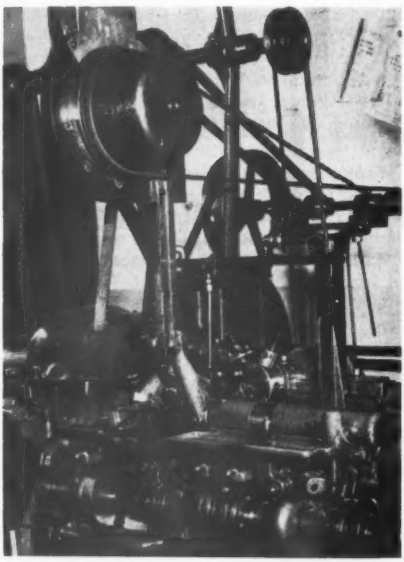


No. 00G Machine on secondary operation, using a Bowl Hopper Feed. This operation involves drilling an eccentric hole and tapping it with revolving tapping attachment. Spindle is stopped in same relative position on each cycle.

Pressworking Beryllium Copper

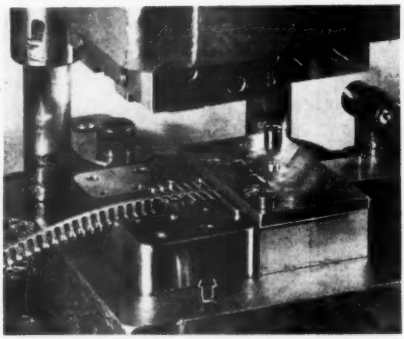
In general, pressworking of beryllium copper strip follows standard procedures for blanking, punching, bending and drawing copper and other copper-alloy products. For best results, however, some consideration must be given to the higher strength level and rate of work hardening of beryllium copper.

by **J. T. Richards**
Development Engineer
THE BERYLLIUM CORPORATION
Reading, Pennsylvania

Of significance is the age-hardening feature of beryllium copper. Parts can be severely formed in a relatively soft condition, then given a simple, low-temperature treatment which imparts the desired combination of final properties. It is not advisable to presswork fully heat treated strip on account of its high strength and limited formability.

In considering the standard beryllium copper alloy (nominally 1.9 Be, 0.25 Co, balance Cu), strip is generally supplied and formed in one of four annealed or annealed and cold rolled tempers. Table I lists typical properties of both heat treatable and heat treated beryllium copper strip.

Many engineers have been hesitant in the past to blank springs and other elastic elements across the strip, feeling that some loss of strength would result. Although directionality influences slightly the forming characteristics of the hardest tempers of beryllium copper strip as indicated below, the mechanical properties of fully heat treated strip are similar in all directions. This means greater economy and freedom of design, since the blank can be laid out in any convenient position consistent with formability.



Courtesy: Instrument Specialties Company, Inc.

Fig. 1. Typical die setup for handling severely-formed beryllium copper clips.

Blanking and Punching

Blanking is the operation of punching flat pieces of the required shape from strip. In order to minimize distortion of the blank, the punch is ground flat and shear is applied to the surface of the die. In most cases, the shearing angle is equal to the stock thickness.

Punching, on the other hand, produces holes, perforations or irregular openings in flat strip. Shear is usually applied to the punch to prevent distortion within the flat sheet.

For strip of equivalent temper and thickness, beryllium copper provides slightly higher resistance to shearing than either phosphor bronze or brass; however, it is easier to handle than spring steel. The shear strength of beryllium copper strip in both the heat treatable and heat treated conditions will be found in Table II.

For blanking or punching, cold rolled strip is preferred over annealed stock since it tends to give a cleaner blank with reduced burr. Although cadmium-plated

The rapidly accelerating growth of the instrument industry in general, the increasing array of electronic test equipment, and other expanding markets have created an unusual demand for beryllium copper products. Alloys in this class are often selected for their excellent electrical conductivity, low drift characteristics, and long fatigue life. They exhibit good corrosion resistance and, also, improved properties in sub-zero temperatures.—W.N.N., Tech. Ed.

strip may offer advantages in forming or drawing operations, it is generally not specified where blanking is the only operation. For best results, strip should be free from oxide or dirt before blanking. Die life obtained with beryllium copper is longer than normally encountered with spring steel, equivalent to phosphor bronze, but less than that usually obtained with brass.

For normal production, oil-hardened steel dies are satisfactory for short runs, while air-hardened steel is suggested for long runs. Carbide or hard chromium dies may be employed for extremely long runs, critical surfaces, or close dimensional control over long periods. Dies should be carefully polished, particularly in the area of radii to reduce copper pick-up or galling.

In designing, clearances between punch and die of 3 to 10 per cent of the stock thickness are necessary to limit work hardening and die wear. These figures represent the difference between punch O.D. and die I.D. To prevent burring in soft stock, clearances must be held from 3 to 6 per cent where possible and the tools must be kept sharp. Otherwise, heavily work hardened burrs will result, affecting the fatigue resistance of the stamping or the success of subsequent forming or fixture hardening processes.

In the case of punching operations, somewhat greater clearances are usually necessary. For example, clearances of the order one-tenth to one-quarter of the stock thickness may be needed for small diameter punches. Where a number of holes may be closely grouped, it may prove

(Continued on page 76)

TABLE I. — TYPICAL MECHANICAL PROPERTIES OF BERYLLIUM COPPER STRIP

Heat Treatable Strip as Supplied

Property	Solution Annealed A	Quarter Hard ¼ H	Half Hard ½ H	Hard H
Tensile Strength, psi	60- 78,000	75- 88,000	85-100,000	100-120,000
Proportional Limit (0.002% Offset), psi	15- 20,000	40- 60,000	55- 70,000	70- 85,000
Yield Strength (0.01% Offset), psi	19- 30,000	47- 67,000	64- 76,000	82- 99,000
Yield Strength (0.2% Offset), psi	28- 36,000	60- 80,000	75- 90,000	100-112,000
Yield Strength (0.5% Extension), psi	30- 37,000	63- 79,000	75- -90,000	77- 92,000
Tension Modulus, psi	17,000,000	17,000,000	17,000,000	17,000,000
Elongation, %	35-60	10-30	5-20	2-7
Rockwell Hardness				
Strip 0.032 in. thick and over (B Scale)	45-78	68-90	88-96	96-102
Strip 0.015 in. thick and over (30 T Scale)	46-67	62-75	75-79	79-83

Strip as Heat Treated by the Fabricator

Property	Solution Annealed AT	Quarter Hard ¼ HT	Half Hard ½ HT	Hard HT
Tensile Strength, psi	165-195,000	175-200,000	185-210,000	190-215,000
Proportional Limit (0.002% Offset), psi	100-125,000	110-135,000	120-145,000	125-155,000
Yield Strength (0.01% Offset), psi	110-135,000	120-145,000	130-155,000	135-165,000
Yield Strength (0.2% Offset), psi	140-170,000	150-180,000	160-190,000	165-195,000
Yield Strength (0.5% Extension), psi	90-100,000	90-100,000	90-100,000	90-100,000
Tension Modulus, psi	19,000,000	19,000,000	19,000,000	19,000,000
Elongation, %	5-10	3-7	2-5	1-4
Rockwell Hardness				
Strip 0.032 in. thick and over (C Scale)	36-42	38-43	39-44	40-45
Strip 0.015 in. thick and over (30 N Scale)	56-62	58-63	59-64	60-65

Statistical Quality Control at Work

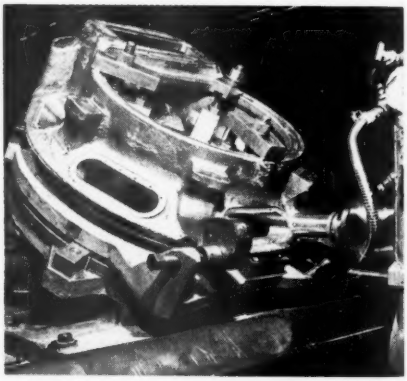
at the Cadillac Tank Plant

A great deal has been written about the setting up of Statistical Quality Control Charts but not too much about their analysis or use. Statistical Quality Control when properly used can become one of the sharpest of management tools.

In any manufacturing process, there are three (3) broad variables: men, material and machines. When a manufacturing process goes out of control, statistical quality control is one of the methods used to pinpoint the "why and what." The easiest way to demonstrate statistical quality control at work is to take actual cases and follow them through to completion.

The Commander's Vision Cupola, Figure 1, on the light tank has five (5) vision ports. The vision ports must be accurately machined for the prism windows. A special integral shank end mill was ground just below the high limit and used to cut both top and bottom surfaces of the port openings. Trouble was encountered with the machining operation in this area. It was easily determined that the prism opening itself was off size. This was accomplished by using routine inspection methods, i.e., go and no go plug gages. Both the go and no go plug failed to pass parts. This led to the belief that possibly the manufacturing process was not capable of holding size within engineering tolerances.

Before reaching a decision to completely retool the operation, a statistical quality control chart was set up to see if the process could be brought into control, and also to see if the tooling and machining were capable of holding size within engineering tolerances. A sample of this chart is shown in Figure 2. Cutter changes are marked with an X, man changes with a code number (A, B and C) and any un-



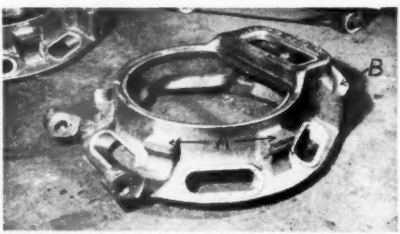


Fig. 1. These views of the vision cupola show two operations brought under quality control: (above) milling the vision parts and (below) the flat skate pad surfaces.

usual material deviation with a circle and number, together with a description of the deviation. A sample of five (5) was used as this would cut down the number of parts, insofar as each prism opening could be classed as one part. The tolerance on the part was + .005".

A close look at the chart will show that the ranges are all within .005" except at times #5, #7, and #9. The variation at #5 was evidently due to the cutter change, and at #7 and #9 was due to material deviation: in this case extremely heavy stock removal at the top with an extremely light cut at the bottom. After thirteen (13) samples had been taken and charted, enough facts had been gathered to analyze.

Referring to the chart, it was noted that the averages were high for a sharp cutter and progressively got lower, and finally went below the limit. This demanded a closer study of the cutter. It was obvious that the cutter size was too large. By reducing the size of the cutter, it was evident that the upper control limit would drop, but the lower control limit would also drop which would still leave the job out of control. A close look at the chart (times #5 and #9) showed that the average dropped sharply just before cutter changes. The grind on the cutter was studied as well as the grade of carbide. The decision was made to alter the cutter grind and go to the next harder grade of carbide.

The results of this change are shown starting with time #14, Operator C. As can be seen the averages fell within tolerance and the ranges are also within tolerance. At time #18, the cutter and the operator were changed and it was noted that the process went out of control. A check showed improper mounting of the cutter. This was corrected at time #19 which brought the operation once more into control.

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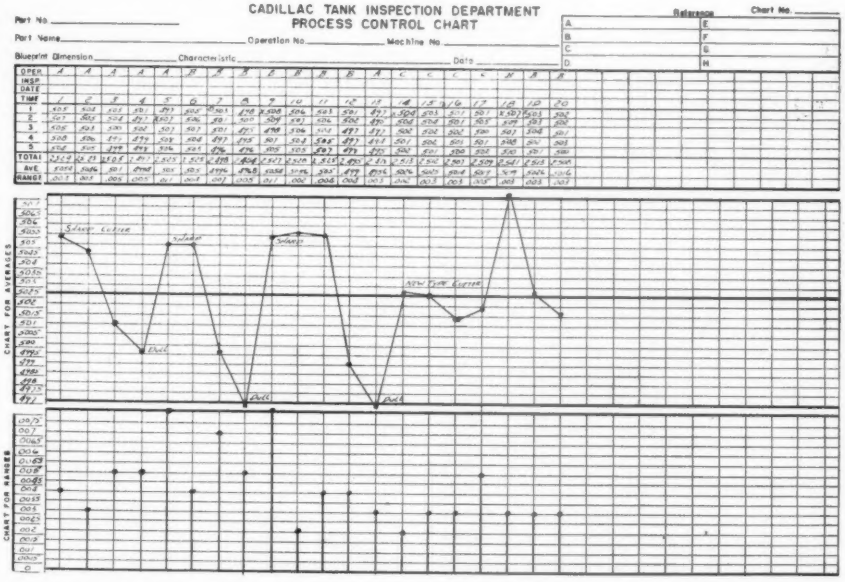


Fig. 2. A sample of the statistical quality control chart showing the results of studies made on the tooling and machining operations affecting the dimensions of the cupola vision ports.

Continuous Press Forging of Automobile Crankshafts

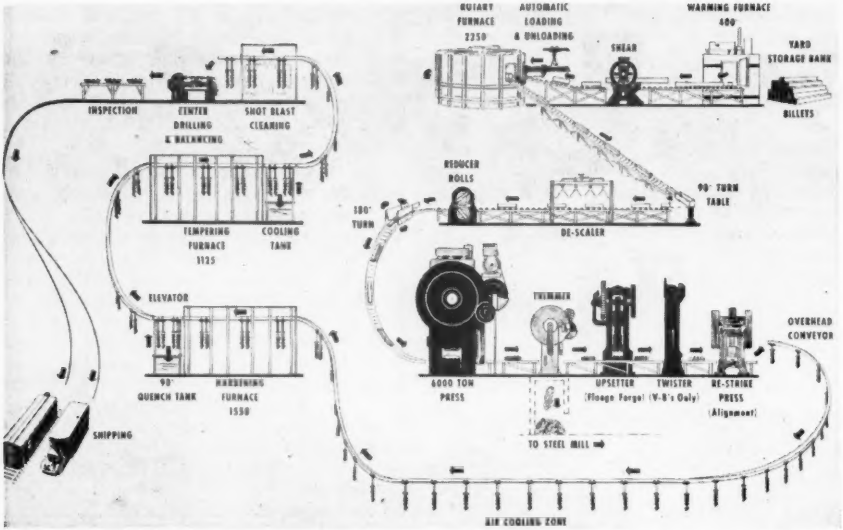
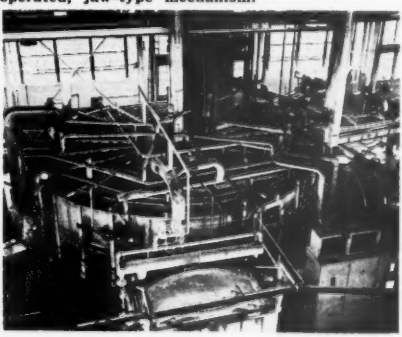


Fig. 1. The progress of a steel billet, from the storage yard until it is shipped as a finished crankshaft forging at the new Crankshaft Press Shop of the Dodge Forge Plant, is depicted schematically above. To permit clearer illustration, the drawing departs from the actual plant lay-out in some details.

Fig. 3. Below. An overhead view of the automatic rotary furnace which is 32 feet in diameter, receives, heats to forging temperature, and discharges steel billets automatically at a rate up to 300 an hour. The billets are moved to the furnace by a conveyor and are then automatically loaded into the furnace by a hydraulically-operated, jaw-type mechanism.



High quality automobile crankshafts now are produced practically automatically by a continuous press forging process at the new Crankshaft Press Shop of the Chrysler Corporation's Dodge Forge Plant in Detroit, which turns out forgings two to three times as quickly as former methods.

Carefully synchronized, mechanical materials handling has been developed. Automatic processes take steel billets from the storage yard and deliver them, at proper forging heat, to one of the largest mechanical forge presses ever built. Through subsequent processes of forging, trimming, flange forging, straightening, heat treating, cleaning and centering drilling, the operation is highly mechanized.

An elaborate system of electrical, mechanical and hydraulic devices, time-controlled or actuated by various trips or photo-electric cells, maintains the flow of materials. Nearly eleven miles of electrical wiring ties in the various elements of handling and moving materials, operating the furnace, the main and supple

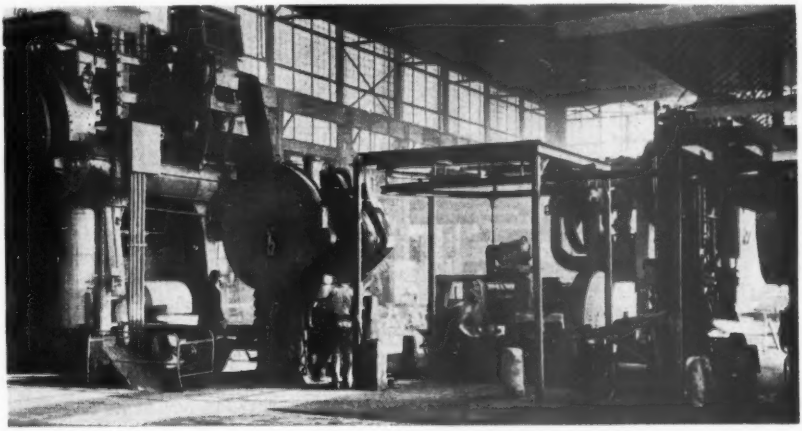


Fig. 2. A general view of the new Crankshaft Press Shop showing the 6000-ton, high speed, mechanical forging press at the left. From the press, moving to the right, are the subsequent trimming, upsetting and aligning operations which precede delivery of the forgings to the heat-treating and tempering processes.

mentary presses, the heat-treating furnaces and the numerous blowers.

Three elements in the system are of outstanding interest. First is a giant, 6000-ton, high-speed, mechanical forging press, which is capable of more than 35 strokes a minute. Another is a rotary, doughnut-type, billet-heating furnace, about 32 feet in diameter, which receives, heats and discharges crankshaft billets automatically. A third feature is the automatic heat-treating and tempering furnaces, which handle the vertically suspended crankshaft forgings throughout the process of heating, quenching and tempering.

The continuous forging system was developed to insure uniform high quality and production efficiency, combined with a capacity for quantities better enabling Chrysler Corporation to meet the demands of its production and to allow for anticipated increases in demand in the future.

A new building, 462 feet long and 150 feet wide, houses the press forge shop. Its steel and masonry construction provides maximum natural light, and an advanced type of forced ventilation not only airs the building but provides individual, adjustable forced air outlets at workers' stations.

Automatic Loading Yard to Furnace

The operation of the continuous press forging process is as follows:

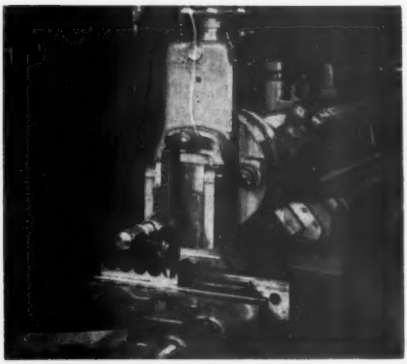
Steel billets, stored in the yard outside the plant, are lifted by a magnetic crane into a rack in the plant wall. These billets, four to four and one half inches

(Continued on page 74)

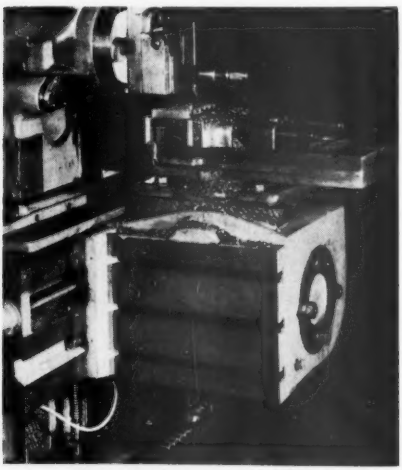
Fig. 4. Huge, automatic, unloading "hands" remove a steel billet, heated to 2250 degrees F., from the automatic, rotary heating furnace. These "hands" seize, lift and remove the white-hot billets without sliding them over the furnace floor.

Metalworking Shapers and Their Uses

by **John E. Hyler**



A common practice is to equip a shaper with an automatic duplicating arrangement for shaping special work. This mechanical contouring attachment is employed in connection with shaping a woodworking bit. On the machine table can be seen one of the cutter blanks, prior to shaping the five flutes in it. The male dovetails serve to hold the bit in the woodworking cutter head. The template or pattern for the fluted shape can be seen below the shaper table. As the table traverses, it is caused to rise and fall in conformance to the template profile.



Above photos courtesy Cincinnati Shaper Co.

(Right) A popular 7" metal shaper much used in toolrooms and on small production work. It has four speeds ranging from 40 to 180 strokes per min. Toolhead vertical travel is 3¼" and for angle work is adjustable from zero to 90 degrees.

There are many aspects of metal shaping. Circumstances differ greatly in plants where chiefly light work is machined as against those in which heavy work is handled. They also differ extensively in plants handling simple and complex work. Since shapers with various lengths of stroke are readily available, the average plant has a good chance to purchase a machine that will fit well within the scope of operations to be performed.

It is always important to have a machine sufficiently large to take care of the largest work to be done, but it is highly uneconomical to do a large amount of very small work on a relatively large machine. Therefore, bench shapers have enjoyed increasing popularity. They are found in many large plants, as well as small ones. Probably 70 to 80% of machine shops have to shape at least a small volume of small tools and parts which may readily be handled on a bench-type shaper.

Some manufacturers of heavy shapers have produced models of much smaller type, to make them more suitable for use where a considerable volume of small work is to be machined. However, the bench shaper is much smaller than most of these, and has a field distinctly its own. It has very low initial cost as against

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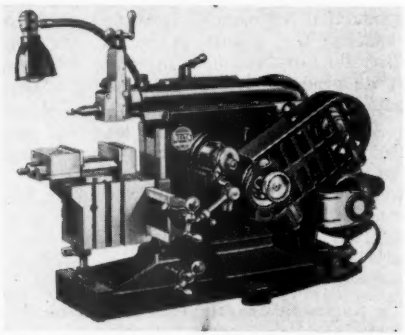
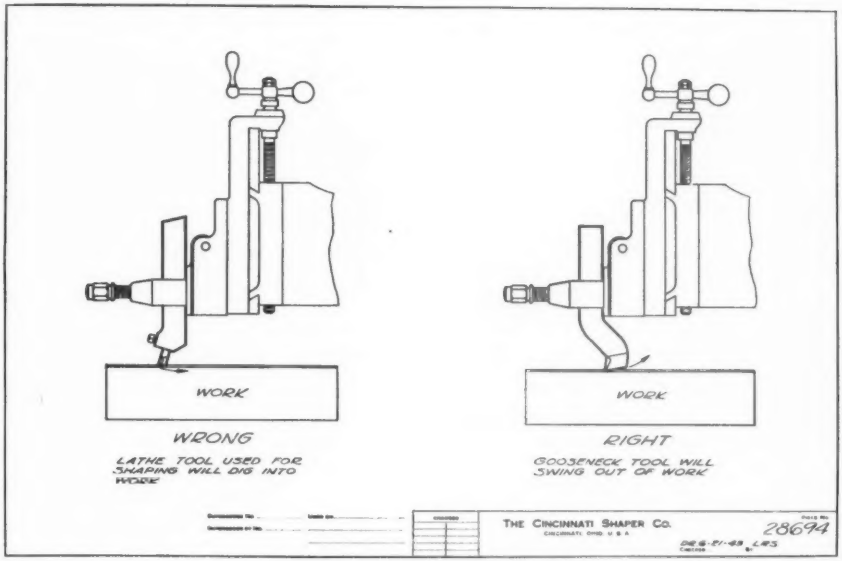


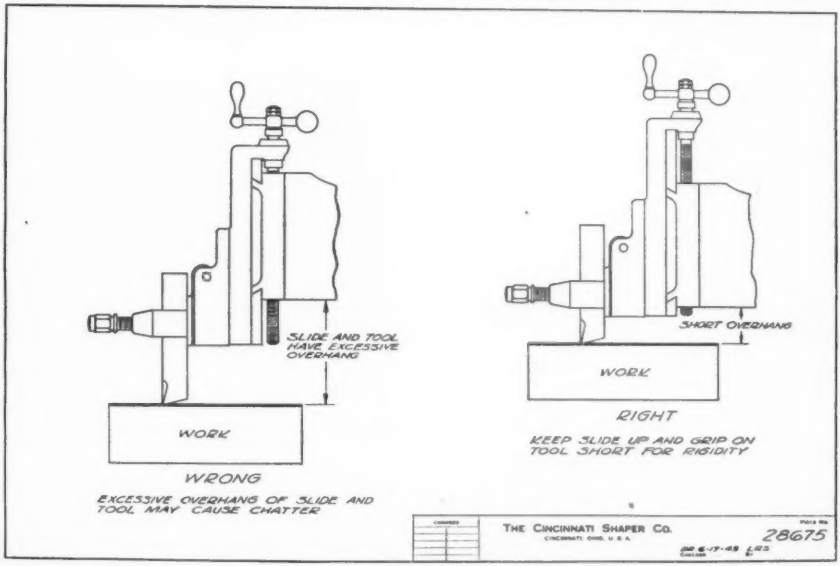
Photo courtesy Delta Power Tool Div., Rockwell Mfg. Co.



Drawings courtesy The Cincinnati Shaper Company.

(Above) This demonstrates the right and wrong tool style in shaper tool posts. The straight lathe tool tends to dig in and cause chatter whereas the tendency of the gooseneck tool is to swing out of the work.

(Below) Another insurance against chatter is to maintain the shortest possible overhang for tool from shaper ram. As shown, the tool slide should be kept well up, thus permitting a short grip on the tool.



. . Forging, from page 71

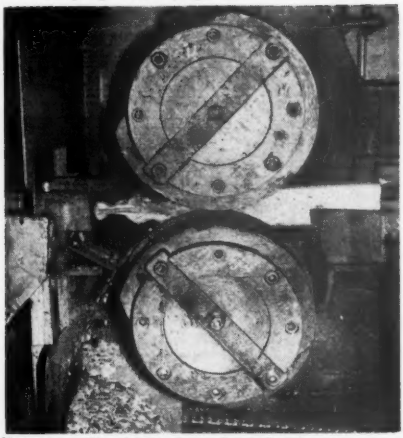


Fig. 5. After being heated to forging temperatures, the crankshaft billets are conveyed automatically to the reducer rolls. A billet is seen passing through the rollers as they change it from its oblong shape to a configuration which distributes the metal in the places needed for the subsequent press forging operation.

square, are then pushed by a hydraulic cylinder into a warming furnace. The furnace is used principally during cold weather to warm billets to as much as 400 degrees F., so as to avoid cracks during the subsequent shearing process.

On emerging from the warming furnace, the billets fall to a conveyor which moves them into a No. 15 shear which is actuated by a trip. The shear cuts the billets into pieces ranging in weight from 106 to 125 pounds, depending upon the kind of crankshaft into which they will be forged.

A conveyor moves the cut billets to the rotary furnace. At this point automatic loading is accomplished by a hydraulic-operated, jaw-type mechanism which picks the billets from a small elevator bringing them from the conveyor, lifts them and moves them into the furnace. The loader carries the billets into the furnace and then gently lowers them to the furnace floor, rather than sliding them in, which would cause wear and possible damage to the furnace floor. Loading may be pre-set to arrange the billets in the rotary furnace for capacities up to 300 an hour.

The doughnut-type rotary furnace is gas-started and oil-fired. Burners play from both sides toward the billets. Temperatures are automatically maintained between 2250 and 2300 degrees F.

From Furnace to Press

Each loading action of the rotary furnace is followed by sufficient movement of the furnace floor to provide space for the next load. This process is continuous and it requires approximately one hour for the heating cycle to be completed.

The entire operation of feeding, loading, movement of the furnace floor and unloading is an electrically-synchronized, hydraulic and mechanically actuated process.

The unloading operation, which takes place adjacent to the loading operation, is performed by a mechanism similar to that loading the furnace, but operating in reverse. The heated billets, after being lifted and moved from the furnace, slide by gravity to a turntable rotating them 90 degrees. They are then conveyed through a four-jet water de-scaler, which operates between 1500 and 2000 psi.

The de-scaled billets next are conveyed to a trip which actuates a No. 10 reducer which, by rolling, distributes the material of the billet into the positions needed for

(Continued on page 78)

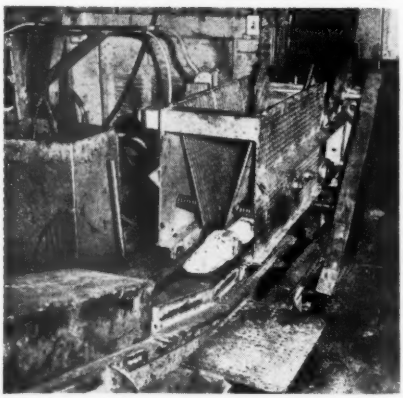
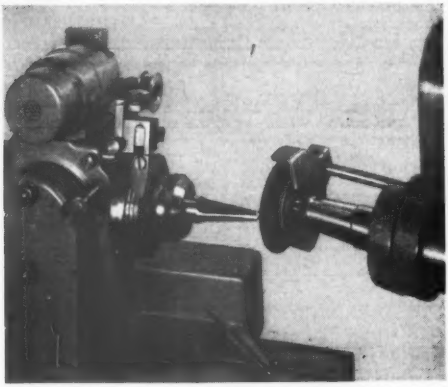


Fig. 6. Having been pushed end-over-end by an air-driven piston, the reduced crankshaft billet is now in position to enter the 6000-ton mechanical forge press employed in the new continuous crankshaft press forging process.

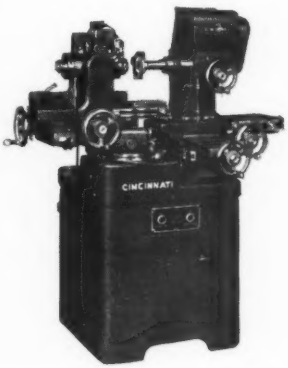
Milling the cavity in a drop forging die. Cutters ground on a Monoset speed up this operation.

Die-sinking cutter and tracer finger—typical work assigned to a CINCINNATI Monoset Cutter and Tool Grinder.



Supporting machine for operation die-sinking

CINCINNATI MONOSET



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Swing over main slide	12" dia.
Length, spindle nose to tail center, maximum	6"
Swivel range of workhead, horizontal plane	235°
vertical plane	40°
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Operation die-sinking might require a standard 7° draft angle cutter; or one having a ball nose; or one for milling a male or female radius; or one ground to a sharp point. All can be quickly and accurately ground—or made from solid bar stock by grinding—on CINCINNATI Monoset Cutter and Tool Grinders. They are the most versatile machines you can buy for work of this type and they're worth waiting for. A completely illustrated catalog tells the Monoset story. Write for publication No. M-1591-1.

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. . . Beryllium, from page 67

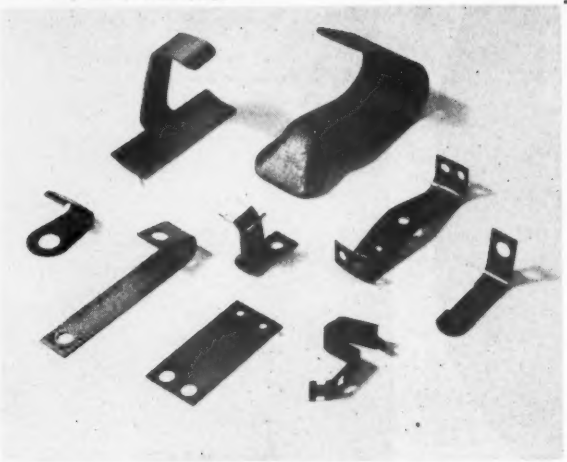


Fig. 2. Here are several typical beryllium copper leaf and contact springs. Other types of elastic elements, contact rings, diaphragms, diaphragm bellows and retaining rings are among the many electrical and instrument components fabricated from beryllium copper strip.

advantageous to use stepped punches.

Although beryllium copper can be blanked in a dry condition, a suitable lubricant will insure longer die life. In most instances, mineral oil or soap and water are employed. Since sulfurized oils will stain beryllium copper unless immediately removed, they should only be used with caution. In all cases, lubricants should be removed prior to annealing.

As indicated above, beryllium copper strip can be conveniently blanked in any direction without affecting the performance of the finished part. This means added flexibility in die design combined with greater efficiency in handling stock. In design work, it is customary to allow a distance at least equal to the stock thickness between the blank and the edge of the strip when the free edge does not serve as the blank edge. The minimum diameter for piercing should not be less than the stock thickness and should be at least 0.025 in. In the case of smaller holes, drilling may be necessary. The minimum wall between the blank edge and a hole is twice the strip thickness with a possible tolerance of the order of ± 0.001 in. Experience indicates that the minimum slot width or the finger width is twice the stock thickness or at least 0.010 in., with tolerance in either case ± 0.002 in.

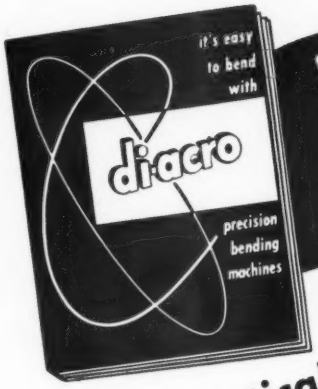
Bending

The temper selected for a given bend radius depends upon the stock thickness and the position of the bend with respect to the grain or rolling direction. From a forming standpoint, temper is generally a result of compromise. Although a high temper offers the maximum possible strength, it also means increased springback which may influence die design and the uniformity of the finished part. Small bending radii may offer space-saving or structural advantages; however, needlessly small radii may cause production problems. Similarly, it should be remembered

(Continued on page 92)

TABLE II. — SHEAR STRENGTH OF BERYLLIUM COPPER STRIP

	Condition	Solution Annealed	Quarter Hard	Half Hard	Hard
Shear Strength, psi	Heat Treatable (as supplied)	45- 60,000	55- 70,000	60- 80,000	70- 85,000
	Heat Treated (2-3 hrs. at 600 F.)	120-135,000	130-145,000	135-150,000	140-155,000



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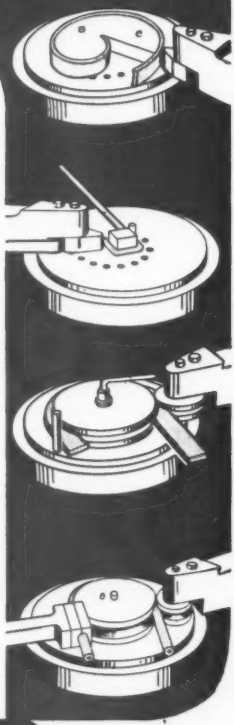

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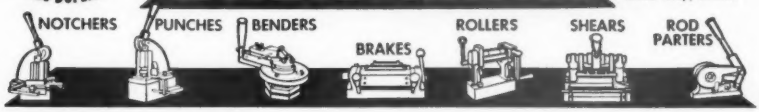

. . . Forging, from page 74

forging. As the reduced billets emerge they intercept a photo-cell which actuates an air-driven piston, turning them end over end thus putting them into position for the press. A conveyor completes the movement of the billet to the press.

The Forging Operations

The press operator then positions the billet for the strikes on two dies in the press. Only one strike on each die is required. The operator then pushes the forging to a conveyor on the opposite side of the die.

Another conveyor positions the forging before the die of a trim press, which is the next operation. Here the operator locates the forging in the trim die. After being struck, the forging is pushed out of the trimmer by an air cylinder.

The material which was trimmed off is removed by the trimmer operator and dropped through an opening in the floor where it falls upon a scrap conveyor which carries it outside the plant for return to the steel mill.

Using tongs, and with the aid of an overhead trolley, an operator then places the forging in a four-inch upsetter machine for flange forging to save subsequent machining.

In the case of forgings for the crankshafts of V-eight engines, the material is forged flat. These shafts then go into a hydraulically-operated twisting machine which twists them to bring the crankpin bearings in proper alignment or index. (Six-cylinder crankshaft forgings are forged in proper alignment to begin with and do not require twisting).

Fig. 7. Only two strikes, one on each of two dies, were required to forge the crankshaft the operator is handling. He is guiding a forging made in the 6000-ton mechanical forging press. This high-speed press is capable of more than 35 strokes a minute and is the heart of the continuous crankshaft press forging operation.

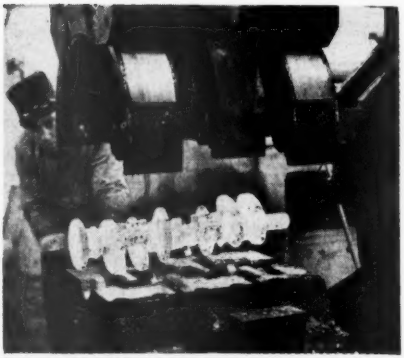

Fig. 8. Crankshafts for V-8 engines are forged flat. The hydraulically-operated twisting machine then twists the forgings to place the crankpin bearings in proper alignment.

From the twisting operation, the forging next goes to a re-strike press where it is correctly aligned. The movement here is, again, a combination of the operator using tongs, assisted by an overhead trolley.

After the straightening process, the operator, again with trolley aid, places the forging on a rack whence it is picked up by an intermittently operated overhead conveyor which moves it through an air cooling zone and then to the heat-treating furnace.

Heat Treating and Finishing

Heat treating begins as the air-cooled forgings arrive via overhead conveyor at the gas-fired, hardening furnace. They are manually transferred to carriers with the aid of an air cylinder hoist. The carriers, operating from a monorail system, each accept four crankshaft forgings, suspended vertically.

An air hoist elevator moves the carriers either to a storage bank or to a supply station where the carriers, in groups of two, are put into position to move into the furnace.

(Continued on page 96)

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Shapers, from page 72

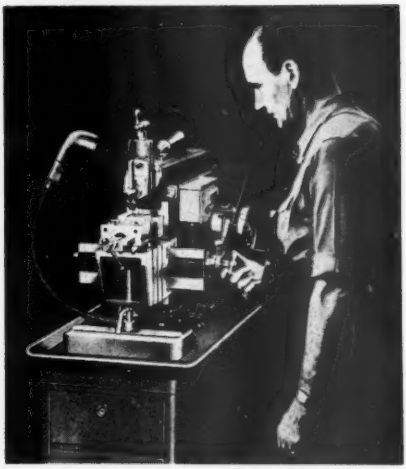


Photo courtesy South Bend Lathe Works.

Then bench shaper illustrated above has a ram stroke of from zero to 7". Four ram speeds are available and they are, approximately, 42, 75, 120, and 195 strokes per minute. These provide four cutting speeds ranging from 3 to 114 feet per minute. The toolhead swivels through 360 degrees and a vertical travel of 3" is provided for the tool slide.

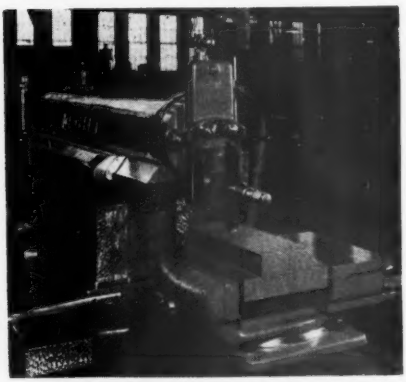


Photo courtesy The Cincinnati Shaper Company.

The above metal shaper of the heavy duty type is shown set up for a surface planning job.

(Right) This small shaper may be on the bench or on a stand as shown. It has a ram stroke of 8" and a vertical toolslide travel of 4". The drive provides four different speeds, operating at 40, 80, 120 and 160 strokes per minute, respectively.

prices of larger machines. It also has low operating cost. Both of these factors add up to higher advantage where small pieces and tools are being shaped than some of us may realize. In consequence, a bench shaper may remain idle for a considerable part of the working day without representing much of a loss as an idle investment, whereas a larger machine tool remaining idle over a considerable portion of the working day is a more serous proposition.

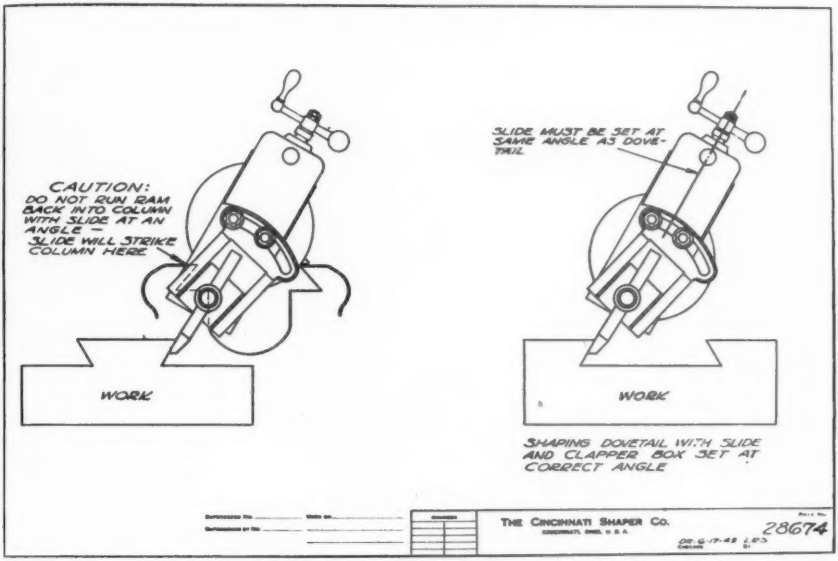
Good For Experimental Departments

Bench shapers are found of particular value in experimental departments, where small models and patterns are being produced more or less continually. Advantages of the bench shaper in a modern tool room are also very high. Here, it may be used both as a roughing and finishing machine. Tooling cost on a small bench shaper is very low, yet it has a great amount of versatility. Power cost on these machines is also very low. Flat types of boring and forming tools, such as are used in engine lathes, boring mills, turning lathes, etc., are quite economically produced at a bench shaper.

Many different types of gages, jigs, fixtures and other accessories connected with tool room practice are handled to advantage with the bench shaper, either

(Continued on page 94)

Photo courtesy Sales Service Machine Tool Co.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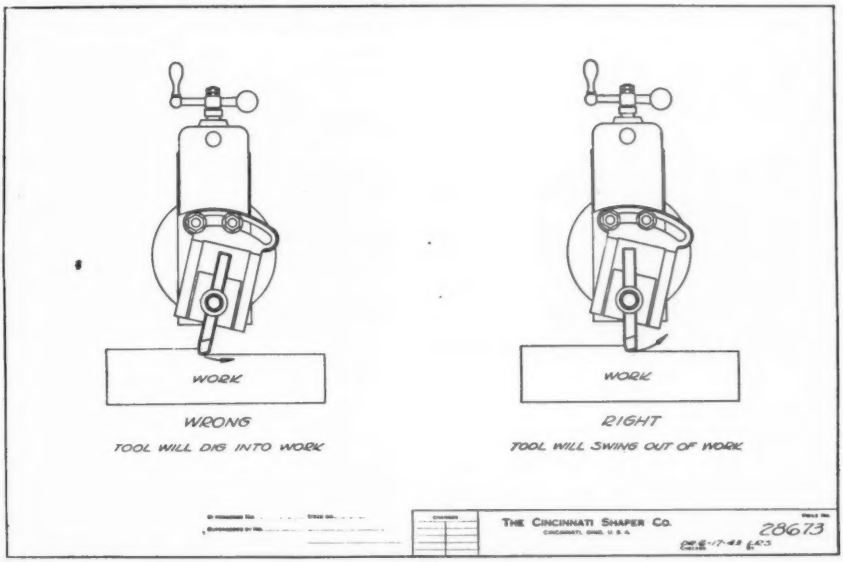
Drawings courtesy The Cincinnati Shaper Company.

(Above) Here are precautions to be observed when operating the shaper with the toolhead swiveled. Workpiece position and ram stroke must be so related that the slide will not strike the column. When machining dovetails, the slide must be set at same angle as dovetail. (Below) To keep the tool free to swing out of the work, its setting should be as shown at the right so that it will not dig in when taken away from cut and spoil the finished surface.



Carbide Tooling

Carbide Tools Speed Production of Oil Well Drill Collars

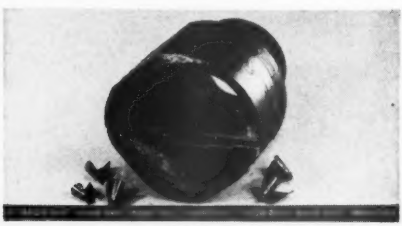
Boring large holes and trepanning operations performed with carbide tools are demonstrated in the following case histories.

Three-inch diameter holes are being easily drilled through 30-foot long chrome-nickel-molybdenum (Brinell 260-320) drill collars in less than two hours actual machining time by use of a carbide, triple edge, off-center drill head shown in Figure 1.

Until recently high-speed steel spade drills were used for this operation. It required twelve to over fourteen hours and three or four tool changes to completely drill one collar.

Figure 2 shows a 3-inch hole which has been drilled half-way through a 30-foot drill collar at 450 revolutions per minute with 0.008-inch feed. Boring bar revolves at 10 revolutions per minute in the opposite direction from the workpiece. Time required for this 15-foot penetration is a little less than an hour. The workpiece will be reversed and drilled from the other end after a freshly ground head is mounted. The two 15-foot holes match in the center to within 1/64 of an inch.

Machine used for the operation is a Niles boring lathe converted to high-speed operation by installation of roller bearings in the spindle and driving it directly with a 50 horsepower DC motor. A rheostat, for controlling speed, is mounted within easy reach of the operator, permitting infinite adjustment to avoid all chatter.



Photos courtesy Kennametal Inc.

Fig. 1. Triple edge off-center head which drilled 3″ dia. hole through 30 ft. chrome-nickel-moly drill collar in less than two hours actual drilling time. Previously-used HSS spade drill required 12 to 14 hours and up to three or four drill changes. Drill head is run at 450 RPM and .006″ to .008″ feed. The stepped tips of the drill head divide chip into three sections which the chip breaker on each tip curls and breaks up for easy disposal through the hollow drill bar.

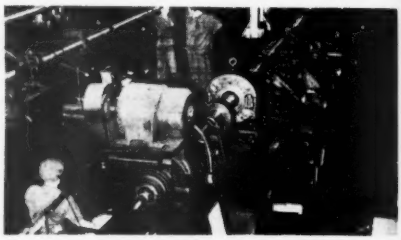


Fig. 2. 3″ dia. hole being drilled in 30 ft. oil well drill collar with a triple-edge drill head. The machine is a converted Niles boring lathe. Operation is done at 450 RPM and .008″ feed per revolution. Workpiece is drilled halfway through in less than an hour.

Operator rides in a seat, Figure 2, on the side of the carriage as it feeds the bar into the workpiece. From this position he can quickly tell the condition of the drill's cutting edges by color and shape of the chips being produced, and can constantly check the power on a wattmeter mounted directly in front of him. Coolant of soluble oil is pumped in around the outside diameter of the hollow drill bar at 90 pounds per square inch pressure and then washes the chips back through the boring bar.

Closeup view, Figure 1, of the 3-inch drill head shows that its cutting edge consists of three stepped tips. These divide chips into three sections while a chipbreaker on each tip curls and breaks up the chip sections for easy disposal.

Point of the drill is 0.170-inch off-center so that it makes a circular forming cut preventing buildup and produces ragged pointed chips shown in Figure 1. Wear pads on the side of the drill head guides the drill from the time it enters the starting hole. These pads and the

(Continued on page 86)

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the effect of Grinding Wheel Hole Size upon balance

Comments are heard from time to time that holes in grinding wheels are too large, which in turn results in a loose, sloppy fit on grinding machine arbors or sleeves. These remarks are often accompanied with the statement that because the hole is large, the wheel is usually mounted off-center, resulting in out-of-truth and out-of-balance conditions.

by **Charles J. Hudson**
Abrasive Quality Consultant

How large should the hole be? The answer is, large enough so that wheels can be mounted easily, without excessive out-of-truth and out-of-balance conditions. There should be ample clearance between arbor and hole to permit expansion of the arbor should it become heated in use. Also, for mechanical reasons, a wheel with ample oversize in the hole dimension can be more safely mounted.

Sometimes machine arbors become worn undersize and requests are received to make holes smaller so as to provide a closed mounting fit. This should never be done because of the danger of breakage if the wheel should be subsequently mounted on a standard size arbor.

In grinding wheel manufacturing standards followed by the majority of grinding wheel makers, allowance for mounting fit "shall be made in the wheel hole and not in the arbor or the wheel mount."*

This means that the dimensions of holes in grinding wheels should always be on the plus side of their nominal dimension so that they will fit freely on the arbor, spindle or sleeve. Among grinding machine manufacturers it is customary never to make the arbor or wheel mount larger than nominal. If the oversize limits of the hole size are held to reasonable amounts, .010" or less, the resultant out of balance will be small and can readily be compensated for with usual balancing equipment provided on precision grinding machines. Factors other than oversize holes can be responsible for out-of-balance conditions.

In this article it is proposed to compute the resulting amount out of balance of an eccentrically mounted wheel when the diameter of the hole is larger than the diameter of the shaft upon which it is mounted.

In order to discuss specific conditions let us consider the following wheel:

42" x 1.720" x 12", A601-N5VA

This wheel is classed as a precision type, used for grinding crankshafts on a sturdily constructed grinding machine.

The hole in the above wheel is held to dimensions of 12.000" + .009" — .000. Let us assume that the hole is at the up-

(Continued on page 90)

(We are indebted to Norton Company for permission to reproduce this article from their publication, "Grits and Grinds", Vol. 43, No. 9. Copyright 1952 by Norton Company. Ed.)

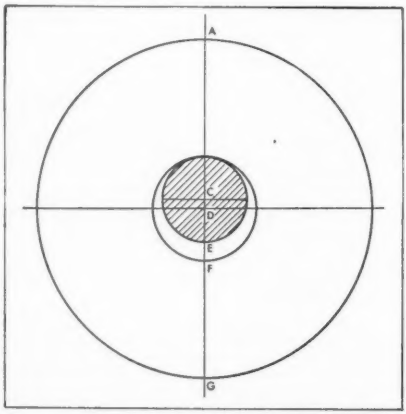

Fig. 1. A schematic sketch showing grinding wheel mounted off-center.

*"American Standard Safety Code for the Use, Care and Protection of Abrasive Wheels", American Standards Association, Approved December 15, 1947, page 14.

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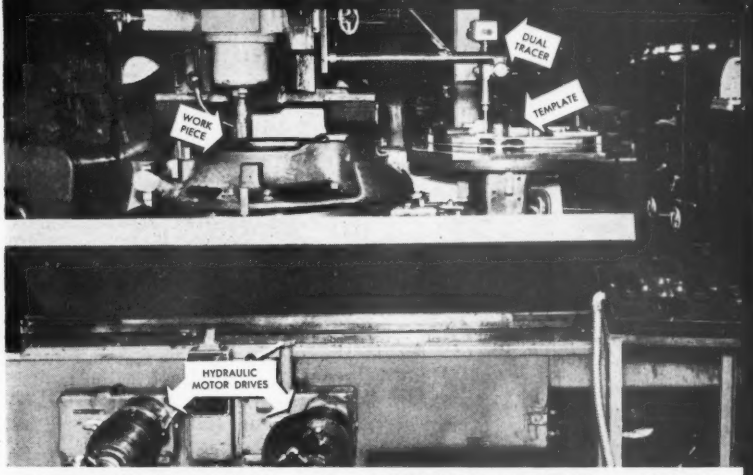

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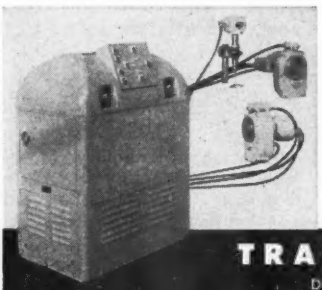

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. . . Carbide Tooling, from page 82

self-center action of the cutting edges assure a straight and true bore. There is about 0.010-inch clearance between the wear pad diameter and cutting diameter.

Drill head bodies are cast steel and require very little machining before brazing in the carbide tips. Two 30-foot collars can be drilled before the bore is undersize. Tips are then salvaged and used in smaller diameter drill heads.

Trepanning Production Increased Ten Times by Use of Carbides

Impressive production increases—up to 1000 per cent—are illustrated in three different trepanning operations by use of carbide tools on forged steel workpieces.

Forged steel line shafts, 9¾-inch diameter by 30 feet long, are now being trepanned with carbide triple edge tools mounted in a 4½-inch diameter trepanning head, Figure 3. Operating at 250 revolutions per minute and 0.006-inch feed, this tool cuts a 4½-inch diameter hole through the work-piece at a rate of 8 feet per hour on a converted 50-horsepower Niles boring lathe.

The 30-foot line shaft is bored half way through, then reversed and bored from the other end. After each 15-foot penetration, the trepanning tool is reground to assure smooth performance with longest tool life.

Three cutting edges of the ¾-inch wide tool divide the chip into three sections which are curled and broken up by parallel chipbreakers for easy disposal.

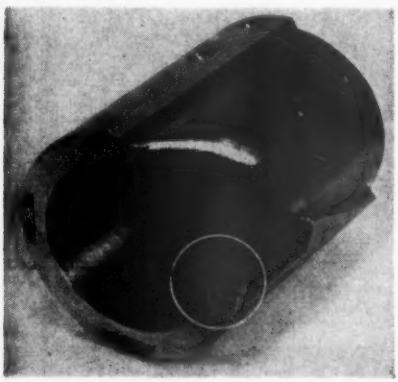

Fig. 3. A triple edge tool mounted on 4½" trepanning head. Cuts a 4½" dia. hole through 30 ft. long forged steel line shaft at a rate of 8 ft. per hour. Operation done on converted Niles boring lathe at 250 RPM and .006" feed. Floor-to-floor time with HSS spade drill was 90 hours. With carbide tool it is only 8 hours.

Fig. 4. A triple edge carbide trepanning tool and chips formed in trepanning 24" dia. hole through a 46 ft. long line shaft. Operation done at 200 SFM and .008" feed. Heretofore job required 250 hours machining time with HSS tools. Now done in only 54 hours with carbide tool.

Heretofore this operation was done with a high speed steel spade drill in ninety hours floor-to-floor time. With the triple edge carbide tool, time is now only eight hours.

In another instance, forged steel rolls up to 28 inches in diameter and 46 feet long, are trepanned with a carbide triple edge tool mounted in a trepanning head as shown in Figures 4 and 5.

With this tool cutting at 200 surface feet per minute and 0.008-inch feed, a 24-inch diameter hole is trepanned through the 46-foot long line shaft with ease. In both the above instances, cores are then used for smaller diameter parts, thus providing a worthwhile savings in essential material.

This operation, which heretofore required 250 hours machining time with high speed steel tools, is now performed in only 54 hours with a carbide trepanning tool.

Outside diameter of the steel roll is turned on another lathe prior to setting up for the trepanning operation on the converted 48-inch Niles lathe. To handle such long rolls it was necessary to ex-

(Continued on page 121)

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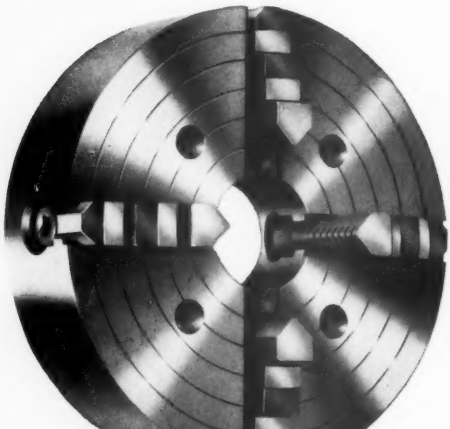
Announcing...
NEW *Buck* 4-JAW CHUCK

DESIGNED ESPECIALLY FOR 9″ TO 16″ LATHES



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WITHOUT EXCESS WEIGHT

Here's great news for every owner or operator of a 9″ to 16″ lathe. Most chucks for such lathes are either too light and cheaply made to hold work securely, or too heavy for the lathe and clumsy to handle. Here is the happy medium—a rugged, precision-built chuck ideal in *both* weight and construction. Full ⅛″ larger diameter operating screws give much more "holding" power for *tighter, surer* gripping. 9 pitch Acme threading makes for quicker, easier adjustment. Recessed body eliminates almost ⅝″ overhang, improving accuracy, reduces chatter, permitting heavier cuts. The new Buck 4-Jaw Independent Chuck is available with standard, long taper key or cam lock adapter in 6″ heavy-duty, 8″ medium-duty, and 10″ light-duty models. In any 9″ to 16″ lathe operation, you'll find its weight, machining, and gripping advantages truly outstanding. Send for full details today.

BUCK TOOL COMPANY

1118 SCHIPPERS LANE • KALAMAZOO, MICHIGAN

FOR PRODUCT INFORMATION USE INFORM-A-GRAM CARD

. . . Screw Machines, from page 65

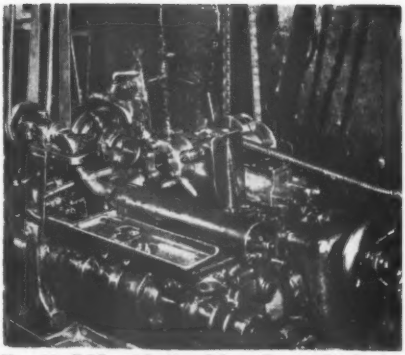
Machines in some sections are grouped so as to provide for specialized production. For example, we have batteries allocated strictly to making screws, others to making studs and pins, and so on. This arrangement reduces the skill requirement factor at some levels and pays off in general, and especially during periods when skill is at a premium.

Normally our operators set up, operate, and maintain their own battery of machines. They report to a lineman who supervises and plans the production for a group of operators. The lineman also instructs operators and checks quality at the start of production runs.

Both the day-work and the incentive systems of wage payment and cost accounting are in use.

Magazine and Hopper Feeds

Because of the many long-run parts that must be produced, it has paid to devote special attention to the problem of getting, where possible, second-operation work done inexpensively. On this type of production, one can very profitably put money into tooling and tool development work directed toward the full exploitation of the automatic.

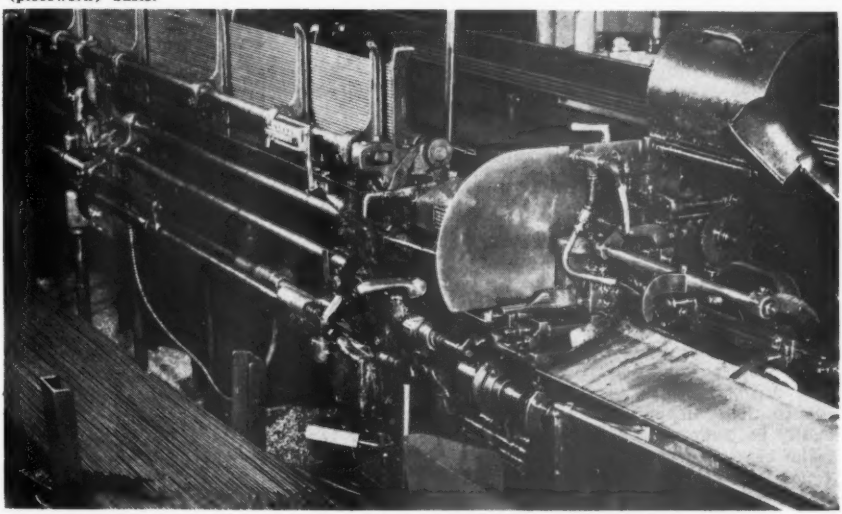


No. 00 B&S with Revolving Turret Tools for drilling, reaming, and cutting identification mark on hex head of part. Turret holes are offset, and spindle stops in same relative position on each cycle to maintain position of offset hole relative to hex head of part. Forming of part is concentric and is done with form cut-off tool in cross-slide.

Accordingly, our screw machine people have come up with many special attachments such as magazine and hopper feeds, turret and cross-slide drilling, milling attachments, and special purpose tools of

(Continued on page 108)

Standard Rod Magazine Feeding Attachment with roll feed and timing mechanism, and turret cutout for rod work with auxiliary stop for long lengths. Lengths up to 40″ are turned out on this No. 00G B&S. Turret still accommodates four tools. Operator handles several machines on incentive (piecework) basis.



. . . Grinding Wheel, from page 84

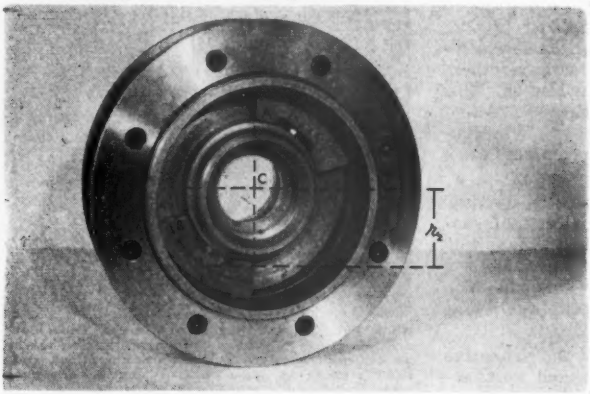


Fig. 2. Balancing wheel sleeve with balancing flange in place showing balancing weights.

per limit of oversize, namely 12.009". Let us also assume that the arbor is .001" undersize or 11.999" in diameter which is in accordance with good grinding machine design.

The difference in diameter between the hole in the wheel and the arbor upon which it is mounted is then .010". How much out of truth will the periphery run? How much out of balance will the assembly be?

Figure 1 is an exaggerated illustration of the above wheel mounted eccentrically on a shaft. The center of the wheel is at the point D. The center of the shaft is at point C. The difference in diameters of hole and shaft is represented by the distance EF = .010".

The wheel therefore will run out truth on the face or periphery not more than .010".

In grinding wheel manufacture, the amount out of balance is defined as the weight applied at the periphery necessary to place a wheel in standing balance.

It can be seen in Figure 1 that the section of the wheel below the point C is larger, and therefore heavier, than the section above the point C. This condition means that a weight must be applied at point A in order to put the assembly in balance. The amount of this weight can readily be computed as follows.

The center of gravity of the wheel is at point D. This is the point where the entire weight of the wheel can be considered as concentrated. If we let W = weight of the wheel and W_1 = amount of counterbalance weight at A, we have the following equation:

$W \times CD = W_1 \times AC$

This means that weight W_1 applied at point A will cause the assembly to be in standing balance.

Let R = radius of the wheel
r = radius of hole in wheel
r_1 = radius of flange pilot or arbor
Then $CD = r - r_1$
$AC = R - CD = R - (r - r_1)$

Hence the preceding formula becomes

$$W_1 = \frac{W\ (r - r_1)}{R - (r - r_1)}$$

This formula gives us the maximum amount of balance of any wheel when we know its weight, radius and difference in dimensions of hole and arbor.

In our example
W = 185 lbs.
R = 21"
$r - r_1 = .005$"

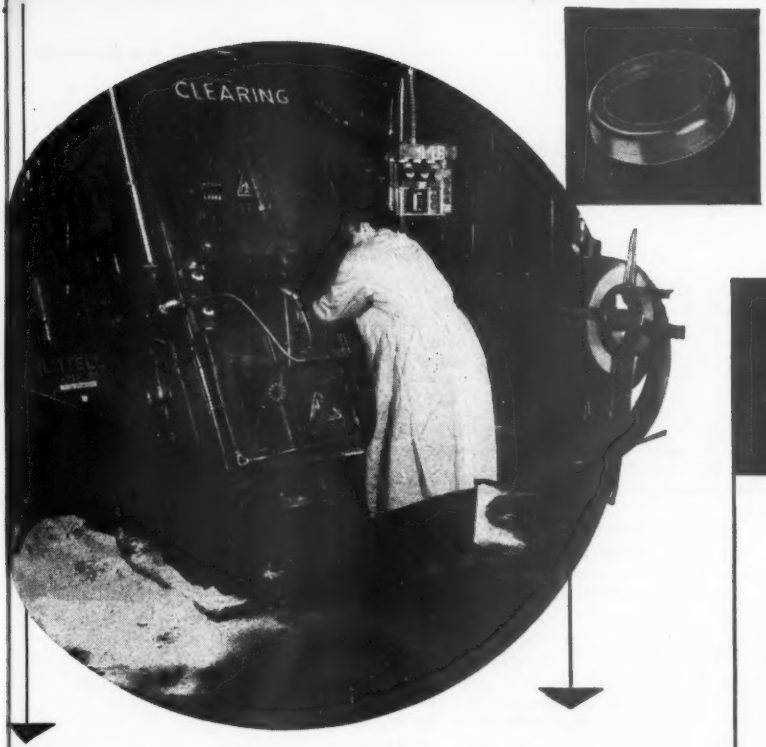
Applying these figures in the above formula, we have

$$W_1 = \frac{185 \times .005}{31 - .005} = .044 \text{ lbs.} = .7 \text{ oz.}$$

This tells us that a weight of .7 ounces at the periphery will balance the above assembly when the cause of out of balance is the result of the hole in the wheel being .010" larger than the arbor or pilot upon which it is mounted.

Obviously the .7 ounce counterbalance

(Continued on page 106)



EARING DOWN ON PRODUCTION

s Clearing press at Aetna Ball & Roller Bearing Co. is equipped with automatic feed combination die so that every press stroke delivers a completed piece. Production his basis brings costs right down to bedrock.

ust as important as speed of production is the *precision* with which the press rates. That's a big reason why Aetna chose the Clearing for this spot.

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CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

. . . Beryllium, from page 76

TABLE III. — MINIMUM RADII FOR COLD FORMING 90-DEG. BENDS IN BERYLLIUM COPPER STRIP. For Heat-Treatable Material up to 0.040 in. Thick

	Ratio, Punch Radius to Stock Thickness					
	Without Orange Peel			Without Cracking		
Angle with Rolling Direction, Deg.	0	45	90	0	45	90
Solution-treated	Sharp	Sharp	Sharp	Sharp	Sharp	Sharp
Quarter-hard	Sharp	Sharp	Sharp	Sharp	Sharp	Sharp
Half-hard	3.0t	3.5t	4.0t	Sharp	Sharp	Sharp
Hard	4.5t	6.0t	7.5t	Sharp	1.5t	3.0t

t = stock thickness

that annealed stock may prove more difficult to blank than a moderately cold worked temper.

In certain critical applications, cadmium-plated strip may prove helpful. The cadmium not only increases die life, but may also be helpful in severe bending or forming through its lubricating qualities. In many instances, some allowance may be necessary in die design in handling cadmium-plated strip.

The selection of suitable die materials and lubricants follows blanking practice. Although it may not be necessary to employ a lubricant during forming, the use of one generally gives increased die life. In the case of long production runs, chromium-plated dies may offer advantages. For fixture-hardening parts less expensive dies can be used, since the final shape is induced by the fixture.

In comparing the formability of other copper alloys with beryllium copper, it will be found that beryllium copper offers greater formability in all directions for a given strength level. On account of the higher rate of work hardening and the greater initial strength of beryllium copper, this strength or hardness level is obtained by smaller cold reductions. As a result, the formability of half-hard breyllium copper strip can be compared with full-hard brass or phosphor bronze stock.

Table III shows the effect of stock thickness, temper and grain direction upon the minimum forming radii of

(Continued on page 100)

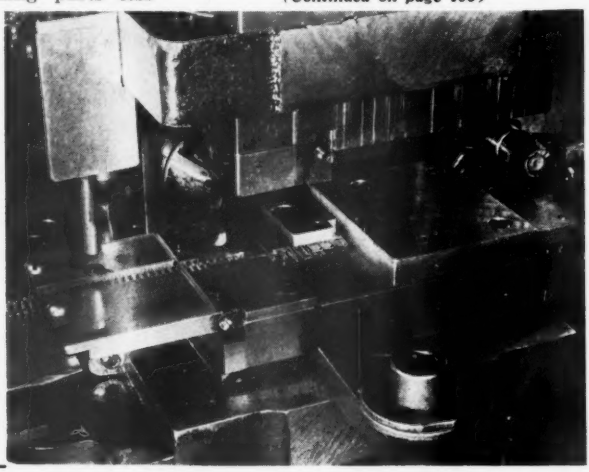
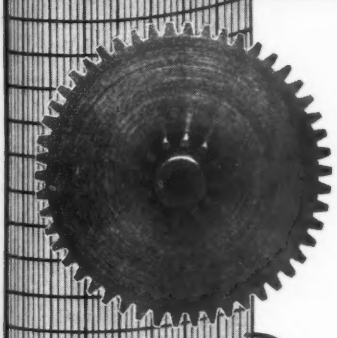


Fig. 3. Progressive die for production of small beryllium copper stampings. Air-hardened steel is frequently used for long runs, with carbide or hard chromium-plated dies being used for extremely long runs, critical surface, or close dimensional control.

Courtesy: Instrument Specialties Company, Inc.

NO. OO HAMILTON PRECISION SMALL GEAR HOBBER



less THAN .0001" COMPOSITE error!

Spur gear: brass: 48 diametral pitch: 50 teeth: 20° pressure angle: less than .0001" composite error: generated on Hamilton No. 00 Precision Gear Hobber.

DEMANDS for mechanical accuracy become more and more insistent as new and improved designs reach production. And machine tools, purchased without consideration for future accuracy requirements, become obsolete before they are depreciated.

Protect your investment in gear generating equipment. Buy the one small gear hobber which is precise enough to meet future requirements, and rigid enough to hold its precision. Buy Hamilton!

←**ACTUAL TEST** (*see illustration at left*) *made before secondary operation. Heavy lines equal .001"—light lines equal .0002". Gear made .004" undersize to allow for secondary operation.*

THE *Hamilton* TOOL COMPANY
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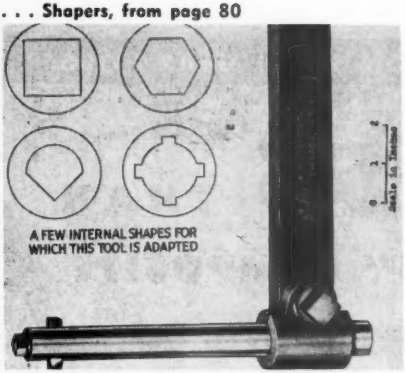
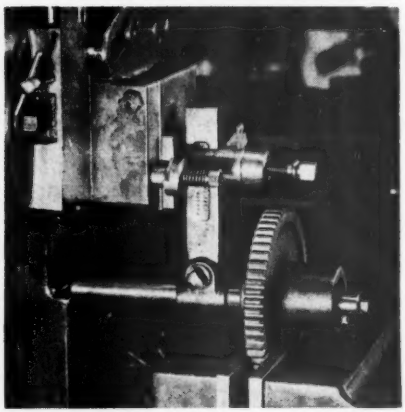
. . . Shapers, from page 80



Photos courtesy Armstrong Brothers Tool Co.

Shown above is a highly versatile extension shaper tool as employed for internal shaping. The heavy shank of the holder when secured in the toolpost permits the cutter bar to be extended and to travel axially. At the left are shown four internal shapes representative for the many which can be produced to advantage with a rugged tool of this type.

(Below) A gear hub keyway being cut with the extension type of tool shown above. Note how the cutter bar is positioned for minimum extension beyond the holder to give a chatter-free cut. A short ram stroke reduces machining time.



for partial or complete machining. A bench shaper is often found highly advantageous when placed closely adjacent to a toolroom surface grinder. These two machines are able to team up on a great amount of work. After a form or outline has been laid out, using either a templet or drawing initially, it is no trick to remove all excess stock with the shaper, holding a clean cut very close to the line. Segmental cuts, single or combined angles, radii, and various other cuts may be produced. Where necessary, a universal vise may be used on the table of the machine.

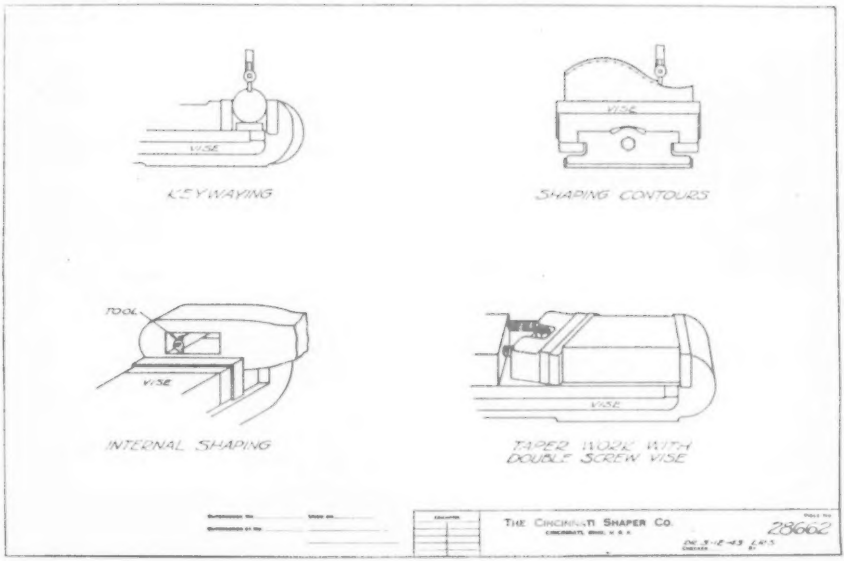
Bench shapers are also convenient on the production floor in many cases where small parts are to be handled, and for machining a variety of work difficult to produce elsewhere. T-slots, open slots, or elongated holes may be produced. Shafts may be machined with keyways, or internal keyways may be cut in bushings or collars as needed. Using suitable tools for the purpose, rectangular, angular and other holes may be machined from an ordinary drilled hole as a beginning.

Other Types of Work Performed

Forming tool holders of all kinds, both plain and dovetailed, may be machined here. Height blocks may be machined. Internal openings in die blocks may readily be finished. Special V-blocks may be produced. Square ends (to accommodate wrenches) are readily machined on shafts, pins, etc. Flats may be faced on round parts as desired. Various types of slotting are readily performed.

Different accessories are available for use with different types of bench shapers. One very good bench shaper having a maximum stroke of 8½" can be provided with a set of index centers having a capacity of 5" between centers, and a 3" swing. These centers are provided with a suitable index plate. An angle plate is also available, which may be clamped either to the top or the side of the shaper table for holding and shaping irregularly-shaped workpieces.

A rotary table may also be obtained for bench shaper use, which has a work surface 7" in diameter. This table is provided with three T-slots. Two of these slots are arranged in parallel. The third slot runs directly across them, on a table diameter. Such a table is highly convenient for clamping and holding a variety of parts requiring slotting, or other jobs on which rotary movement of the table during machining is of advantage. In addition to regular shaper tool holders, special keyway tool holders are available. Such may be used in place of the regular toolpost in the shaper. They are desirable when doing inside work, such as keyways and slotting. Extension tool holders are



Drawing courtesy The Cincinnati Shaper Company.

These sketches show the proper work-holding methods to employ for a variety of shaper setups. Secure holding is as important to shop safety as it is to successful machining.

convenient for various types of internal work.

Other Bench Shaper Features

Automatic controls can be and are applied to some small bench shapers. They have been observed in use on shapers having but a 7" stroke. An automatic control can equip a small shaper of this for high production on small work at only a fraction of the cost of special machinery. Some small bench shapers incorporate a V-groove in the side of the table, allowing round pieces of work to be tightly clamped in it, so their ends may be machined.

This type of shaper has the ram powered by a hydraulic cylinder. A pair of limit stops may be set to govern the length of the ram stroke and the position of the stroke relative to the workpiece. Changing either length or position of the stroke, or both, becomes a very simple adjustment. These shapers are built in five different sizes, ranging in stroke length from 13" to 30".

Photo courtesy Rockford Machine Tool Co.

Some manufacturers of bench shapers have gone all out in the matter of providing accessories to increase work versatility. Indexing centers are provided, which allow spindles to be cut, flutes to be machined, gears to be shaped, hexagons, squares, and other polygons to be accurately produced. Indexing tables are also highly convenient for machining squares, hexagons, angular slots and flats, clutch teeth, etc. Universal tables are provided by some for use with their bench shapers. Mounted atop the shaper table, a universal table may easily be moved in any direction, and may be positioned, with extreme accuracy.

Some even provide surface plate kits. These surface plates, in connection with angle plates and V-blocks, are highly advantageous for accurately laying out

(Continued on page 103)

. . . Continuous Forging, from page 78

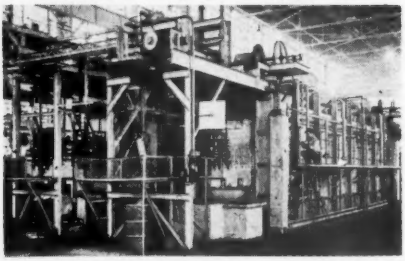


Fig. 9. Pictured are the twin, automatic hardening and tempering furnaces which heat, quench and temper the crankshaft forgings automatically. Carriers, operating from a monorail system, each accept four forgings suspended vertically.

The carriers enter the hardening furnace at intervals of just over three minutes. They pass through the furnace in 100 minutes, subjecting the forgings to a temperature of 1550 degrees F.

On emerging from the furnace, the carriers are lowered, immersing the forgings in a tank of water held to 90 degrees F. Here a quenching action takes place for 70 seconds. The water is agitated around the forgings to obtain maximum Brinell hardness.

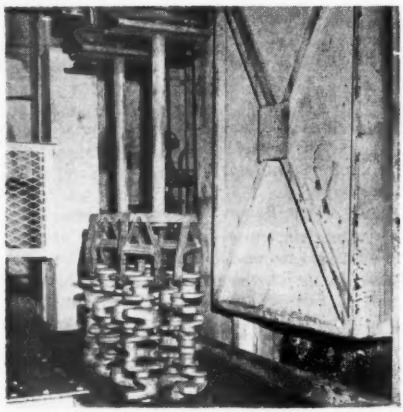
An elevator raises the carriers from the quench and back to the monorail where they move into a gas-fired tempering furnace, again at intervals of just over three minutes. The carriers, still in pairs with each carrier holding four crankshaft forgings vertically, move through the tempering furnace in 120 minutes. Tempering is done at 1125 degrees F.

As the forgings emerge from this furnace they are lowered into a tank of water to be cooled, raised and returned to a monorail for movement to a shot blasting process for cleaning.

When the shot blast cleaning is finished, the forgings are manually transferred, with the aid of an air hoist, to a conveyor moving them to a machine where centering drilling is performed for subsequent machining operations.

The centering operation is set up and performed to constant dynamic balance checks. A subsequent alignment procedure straightens the forging to static balance on live centers. After gauging and inspection for hardness and possible defects, the material is ready for shipping.

Fig. 10. Crankshaft forgings, heated to 1550 degrees Fahrenheit, are automatically quenched for 70 seconds in water held to 90 degrees F., in a part of the automatic heat treating and tempering processes. The photograph shows eight crankshaft forgings, after leaving the furnace, being lowered into the automatically-agitated quench.



New Booklet Gives Ideas for Broadening Workers' Skills

A 16-page, illustrated booklet containing ideas and suggestions for broadening the skills of the Nation's work force has been published by the Bureau of Apprenticeship of the U. S. Department of Labor.

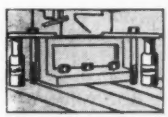
Titled, "Your Skill Improvement Program", the booklet emphasizes the importance of developing training programs to meet specific needs, sets forth ideas and suggestions for the organization and operation of skill improvement programs, and provides a check list to enable an employer to make a spot evaluation of his current training position.

Copies of this booklet may be obtained from the Publications Branch, Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.

Supports 10 tons in any position

LEMPCO SAF-T-PROP

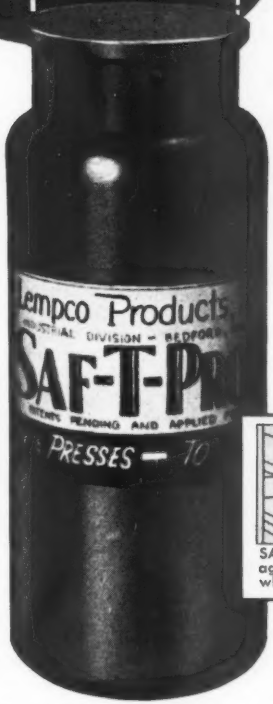
Clamp support for work on machine tool tables



Infinitely adjustable as a spacer or clamp support in holding down work on miller, planer, shaper and other machine tools

Props open die sets while repair or alignment of die is being made.

Patents pending and applied for.



Props dies and press open for service.

Pull the ram up to any position and it remains there supporting loads up to 10 tons. To lower, turn SAFTPROP upside down and inner cylinder falls back into original position. No screws, ratchets, shear pins, or hydraulics. 100% positive support by solid steel mass.

Scores of uses in a shop; 1. as a clamp support for holding down large work pieces on grinders, shapers or millers. 2. separates punch and die while aligning or replacing die segments or when removing and storing dies; 3. acts as safety stop against accidental ram movements. Sold in sets of 4 with a range from 2½" to 12" high. Write for folder on how SAFTPROPS save time and protect workers from accidents.

SAFTPROPS used as a safety stop against accidental movement of ram while operator is working under ram.

Sold in sets of 4

SAFTPROPS can be bought individually or in sets. A set consists of one each of the following sizes: 2½"—3⅝"—5⅜"—8" high; when fully extended they measure respectively 3⅝" — 5⅜"—8"—12" high.

$18.50 SET

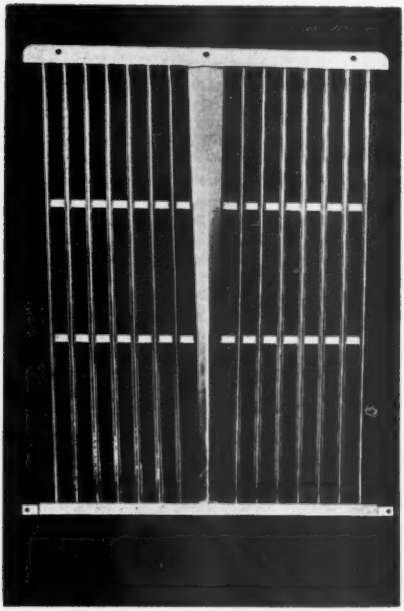
Lempco Products, Inc., 5500 Dunham Rd. (Industrial Division), Bedford, O.

LEMPCO *for 35 years... a leading builder of machine tools*

Bright Zinc Finish Performs Double Duty

Ingenuity stimulated by the finishing of a truck radiator grille guard has paid off double: in relieving a material shortage and in an appreciable cost reduction.

The truck manufacturer faced with the shortage of nickel and stainless steel had decided on a paint finish for its grille guard rather than using scarce stainless steel or nickel-chrome plating. However, two disadvantages resulted from the paint finish. First, the paint did not give the corrosion resistance desired and second, it detracted from appearance considerably.



This truck radiator grille guard has been finished with a bright zinc dip. In view of the shortages in nickel and stainless steel, the application of zinc presents a new solution to bright and durable finish specifications. To the inexperienced eye the difference between zinc finish and chrome is not apparent.

It was then that Modern Process Plating Company came up with the suggestion that a bright zinc dip might meet the manufacturer's specifications satisfactorily.

Tests of this method of finishing were extremely satisfactory and exceeded specifications both in appearance and corrosion resistance.

The truck manufacturer's specifications on corrosion resistance for chrome-nickel plating had been 72 hours resistance to salt spray. The bright zinc dip with the additional protection of lacquer showed only very slight discoloration at 72 hours but no signs of corrosion or rust, and it was not until 120 hours had been reached that the first spot of rust had appeared.

In appearance the bright zinc dip exceeded stainless steel in brightness, and was only less brilliant in apperance than the chrome-nickel plating, both of which had been previously used.

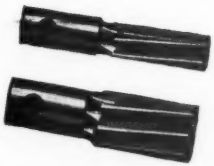
The bright zinc plating was done at considerably less cost and one of the major factors is elimination or reduction of polishing and buffing operations which represents a considerable item in direct labor charges. Under normal conditions no polishing is required, though if the metal is rough some touch-up may be needed.

While the truck manufacturer had previous specifications on the thickness of plated materials, no such specifications were set up in the case of the zinc. However, the previous specification used on plated grilles, 72 hours resistance to salt spray, was retained as the only necessary specification beyond satisfactory appearance.

Because of the satisfactory performance of the bright zinc dip it is now being considered for temporary use, during the shortage period, on door handles and headlamp rims and possibly on internal chrome trim which has a specification of only 48 hours salt spray resistance.

It is thought that this new solution to bright, durable finishing has application on many other products where it will become a satisfactory substitute.

Modern Process Plating Company, 4102 Hough Ave., Cleveland, Ohio, invites inquiries from other manufacturers who have found themselves handicapped because of the nickel and stainless steel shortage. **Inform-A-Gram Key No. D3.**



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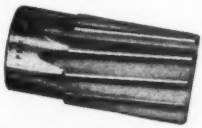

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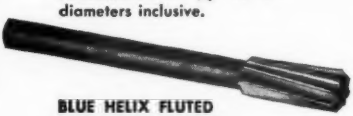

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. . . Beryllium, from page 92

beryllium copper strip. This data is based upon the minimum punch radius for cold forming a 90-degree bend in strip ranging from 0.005 in. to 0.040 in. thick. For convenience, formability is expressed as the ratio of punch radius to stock thickness. As indicated, solution-annealed and quarter-hard strip up to 0.040 in. thick can be cold formed to a 90-degree bend around a sharp radius without cracking or exhibiting "orange peel". Some allowance must be made for forming strip over 0.040 in. or bending to angles greater than 90 degrees.

A material of reduced formability will crack when formed around too sharp a radius. This tendency decreases as the punch radius is increased, until only an orange peel effect can be observed. Further increases in punch radius cause the orange peel to disappear. Although orange peel may cause an objectionable appearance, its occurrence probably does not affect the life of the part except in critical applications.

There are several other points that must be considered in forming. Although beryllium copper strip is usually formed prior to age hardening, bending may occasionally be necessary during assembly or operation. It is sometimes possible to lightly form fully heat-treated thin-gauge strip, depending upon the temper originally selected. Where moderate formability is required, a special under or over aging treatment may be needed with some sacrifice in final properties.

Springback, resulting from bending, increases for a given thickness with temper and punch radius as shown in Figure 4. In the case of harder tempers, springback may also increase with an increase of the angle with the direction of rolling. For a given punch radius, springback decreases with an increase in stock thickness.

Under normal fabricating conditions, the expected variation in springback runs from 5 to 10 degrees. For angular tolerances under ± 3-5 degrees, it may be necessary to consider fixture hardening. Although angular tolerances will largely depend upon stock thickness and design, they can, under favorable conditions, be held to ± ½ degree with a jig. In forming offsets, the distance between parallel

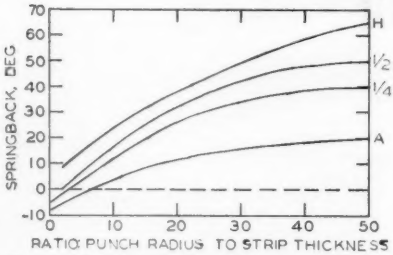

Fig. 4. Approximate springback of heat-treatable beryllium copper strip formed at 90° bend. Negative values are probably due to a slight degree of coining; consequently, value will vary with punch setting. On the above curves, H = hard stock, ½H = half hard, ¼H = quarter hard, and A = annealed.

sections can usually be held to ± 0.010-0.015 in., while tolerances of the order of ±0.001-0.003 in. are possible with fixture hardening.

Since beryllium copper can be stress-relieved in the age hardening range, it is possible to fixture harden parts during aging. In many cases, the tolerances obtainable are dependent upon the tolerances of the fixture. Through this method, angular and flatness tolerances as well as a degree of uniformity can be held that would not otherwise be attainable.

Although the data presented in Figure 4 is typical where no provision has been made for controlling springback, springback may be prevented in pressworking by hitting home or coining the inside of the bend to fit the desired angle. If this is not done, it will, of course, be necessary to allow for overbending in designing the die.

Drawing

In drawing, a flat blank is subjected to varying combinations of tensile and compressive stresses to cause the metal to flow to the desired shape. In many instances of light cupping, the movement of the metal is not excessive. On the other hand, in deep drawing the deformations are severe and the metal is heavily cold worked. Where excessive depths are required, it may be necessary to include an intermediate anneal between successive drawing operations.

The temper selected will depend upon the depth of draw. For deep drawing,

(Continued on page 104)

NEW boring tool set by PORTAGE Quick Change

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- MILLING MACHINES

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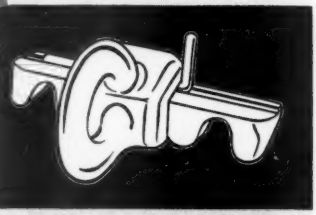
1. Safety Flange
2. Lock Jaw Lifting Device
3. E-Z Lift Sling Chain

1 SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe. This flange may be mounted flush or on the edge of the die set and is welded in place. *There is no extra charge for this valuable safety feature.*



2 LOCK JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set. They are positioned to insure proper balance when the set is lifted by either chain fall or crane.

3 E-Z LIFT SLING CHAIN

is especially designed to fit the safety flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs. Nor is there danger of distorting stresses being set up in the die or set because of improper lifting.

It's no longer necessary to take needless risks in handling die sets. Risks that might easily injure the hands of skilled die makers, ruin costly dies in process or completed, or even damage press equipment. Safety features of Superior die sets have eliminated all of these dangers and have speeded up the overall handling of sets from the bench to the press. Prove to yourself the merits of these safety features in both small and large die sets.

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SUPERIOR STEEL PRODUCTS CORP.
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. . . Shapers, from page 95

work to be performed on the shaper. Angle plates and V-blocks with the surface plate may also be employed for clamping work on the shaper table.

Universal Tables And Tilting Tops

Larger and standard ram-type shapers may be and sometimes are provided with universal tables. Certain machines have a tilting top, adjustable through 30 degrees each side of center, forward and backward, while the entire table can be rotated through 360 degrees around its horizontal axis, adjustments being made through worm and wheel combinations.

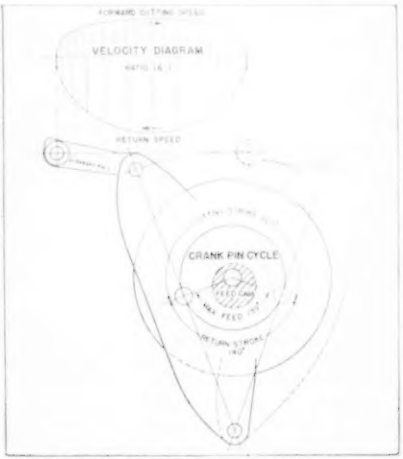
Some very fine shapers have their rams hydraulically powered. These have an advantage over a crank-type feed, in that drive speed is uniform throughout the stroke of a hydraulic machine. One firm making hydraulic machines provides standard shapers of the ram type sufficiently large to take care of work up to 28" in length. For work requiring longer strokes, they provide an open-side shaper. This machine reciprocates the workpiece instead of the cutting tool.

The standard shaper seems able to continually increase the scope of its applications as a manufacturing tool. It is particularly suitable in cases where a considerable amount of metal must be hogged out, but is also extensively used for precision finishing of parts to close tolerances. The machine can be quickly set up, and maintains a relatively high production rate. In addition, cost of tooling the shaper is low.

Special Tooling Possibilities

One interesting application of the standard shaper to manufacturing is the possibility of using a form tool to make a specific type of cut. Another interesting possibility often exploited is the employment of multiple tools. Two or more slots or other cuts may quite often be made simultaneously, where a job is properly planned and tooled. Often, shaper manufacturers can recommend special methods of tooling, or special types of automatic control to allow high production.

In connection with carbide tools, it is important to have a machine which can be operated at very high speeds. Only high speed use of a shaper will justify



Drawing courtesy The Cincinnati Shaper Company. This diagram shows how the crank pin cycle of Cincinnati shapers is converted mechanically to give the ram a relatively slow forward cutting speed and a high return speed.

the additional investment involved in carbide tools. Also, a tool lifter must be employed which operates perfectly in regard to holding the tool edge clear of the work on the return stroke. This is necessary in every case. An operator cannot lift the clapper manually when the machine is operating at a speed of 100 feet per minute or more. Use of a standard shaper in connection with carbide tools should be adopted only after operating recommendations have been made by the shaper manufacturer or by a reputable producer of carbide tools.

Many jobs are readily machineable with a standard shaper that are difficult to produce in any other way. Many irregular shapes are internally machined with a simple extension tool. Keyways of different types may be cut to close tolerances. Machining internal guides of relativley-large gate valves is another difficult job which a shaper does with efficiency. Spline shafts, gears, ratchets, and similar parts are readily machined, using shaper index centers. Cams may be contoured, using an automatic cross feed together with a hand-operated vertical feed. Where tracer control is employed, automatic contouring of many types of work is relatively simple.

. . . Beryllium, from page 100

annealed material must always be used. Where intermediate annealing is required, considerable care should be exercised during cleaning to prevent excessive die wear. Light cups, including diaphragms with shallow corrugations, can frequently be drawn from quarter-hard or half-hard strip. As previously indicated, it is advantageous to use material of increased temper due to the lack of stiffness and associated handling problems found in annealed material.

In the case of critical deep-drawing applications, some compromise in grain size is necessary. Fine-grained material may not provide sufficient ductility, while a coarse-grained-structure, although ductile, tends to stretch rather than flow in the die. At the same time, a coarse-grained material may not have sufficient strength to prevent bottom breakage. In addition, coarse-grained material may have an objectionable appearance following drawing as a result of "orange peel".

Rapid work hardening limits the depth of drawing beryllium copper, although the extent of the reduction depends upon tool design and blank thickness. Reductions in blank or cup diameter of the order of 30 to 40 per cent are typical. It will be appreciated that smaller reductions may be necessary in the case of thin gauge stock.

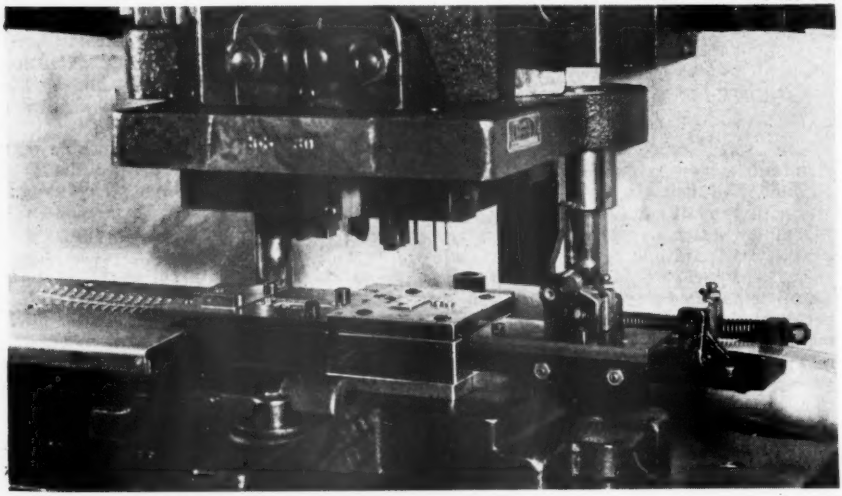
For best results, a double-action press and blank holder are preferred. In the case of a single-action press, some difficulty will be experienced unless the blank thickness is great enough in relation to its diameter to prevent wrinkling. Compressive stresses tend to wrinkle the blank rim, but this can be prevented by careful adjustment of hold-down pressure or can be eliminated by ironing. Some caution must be observed to prevent excessive hold-down pressures, otherwise the normal displacement of metal will be obstructed.

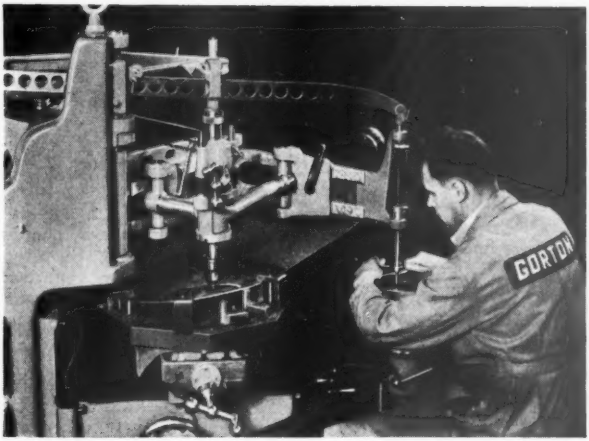
The slower forming rate of a hydraulic press, plus closer control over forming pressures, provides a more uniformly drawn product. As a result, it may be possible to draw cups or similar shapes with a hydraulic press which would not be feasible in a power press.

In general, punch and die design for drawing beryllium copper follows phosphor bronze practice. Because of the slightly higher hardness of beryllium copper for equivalent strip tempers, more power, lower speed and stronger tools are

(Continued on page 112)

Fig. 5. Fully-automatic progressive die used for beryllium copper radio tube socket terminals. Courtesy: Instrument Specialties Company, Inc.





Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

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By George Gorton III
Executive Vice President
George Gorton Machine Co.

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INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

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A new booklet, "Pantography," explains the process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 1211 Racine St., Racine, Wisconsin, U. S. A.

. . . Grinding Wheel, from page 90

weight cannot be placed at the periphery. If the wheel sleeve is provided with balancing flanges, a weight in the flanges somewhat larger than the weight at the periphery must be applied. This flange weight will be $W_1 \times \frac{R}{r_2}$, where r_2 equals the distance of the center of gravity of the flange weight from the point C. Assuming $r_2 = 3''$, the flange weight becomes $.7 \times \frac{21}{3} = 4.9$ oz. If $r_2 = 6''$, this weight than becomes 2½ oz.

A balancing type wheel sleeve is shown in Figure 2. It is equipped with movable balancing weights at points A and B. The distance r_2 in the above formula is shown for one of these weights.

It has already been pointed out that at most the wheel will run out of truth at the periphery .010". This amount is about equal to the combined thickness of three pieces of ordinary writing paper—a small amount. The average diameter of one grain of #80 abrasive is about .010" which again tells us that we are dealing with an exceedingly small magnitude in discussing grinding wheel dimensions.

The foregoing discussion has to do with the class of wheels known as precision grinding wheels. There are many so-called offhand grinding operations where a nice degree of balance is not required. Examples of offhand grinding are to be found on floor stands, swing-frame grinders, etc. The chief object in offhand grinding is to remove metal. Resultant finish and dimensions are usually not important.

Let us discuss the conditions of a standard resinoid snagging wheel such as the following:

16" x 2½" x 6", A14-T4B7

Assume that the diameter of the hole in this wheel is 6.008" and that the diameter of the arbor is 5.999" or .001" undersize. The difference in diameters is then .009".

Assume also that this wheel is mounted off center as far as possible as represented in Figure 1.

Using the same formula as previously, the amount out of balance is

$$W_1 = \frac{W\ (r - r_1)}{R - (r - r_1)}$$

Where

$W = 46$ lbs.

$R = 8''$

$(r - r_1) = .0045''$

$$W_1 = \frac{46 \times .0045}{8 - .0045} = .026 \text{ lbs.} = .4 \text{ oz.}$$

In the above illustration an arbor diameter of 5.999", or .001" under nominal, was chosen. In actual practice, arbors are frequently permitted to wear more than .001" under nominal. This means that $r - r_1$ becomes larger, with a resultant greater amount of unbalance possible if the wheel is mounted with the hole eccentric on the arbor.

The conclusion may be drawn that when the diameter of the hole in a grinding wheel is held to within reasonable oversize limits, the resultant out-of-balance condition will be extremely small. On precision grinding machines, the amount of unbalance can readily be corrected with balancing flanges.

Grinding wheels are usually tested for balance characteristics before shipping. Balance is maintained within certain limits either by expert manufacturing procedures or by minor corrections after testing.

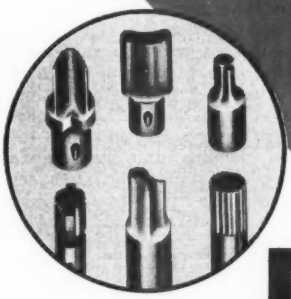
In commercial practice we are always faced with limits. Grinding wheels and other rotating objects are never in precise balance. Dimensions of grinding wheels, of arbors on which they are mounted, and balance of the rotating parts of the grinding machine are never *exact* in the dictionary sense. These characteristics are usually held to "within limits". Good grinding wheel manufacturing procedure depends upon knowing what the limits are and the means and desire to keep within these limits.

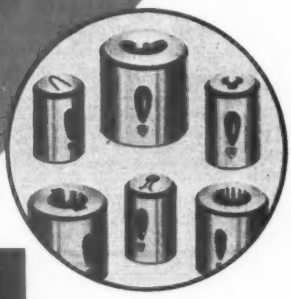
In grinding wheel manufacture the most important dimension is the hole diameter. It is important that the hole diameter always be held a few thousandths oversize—never undersize.

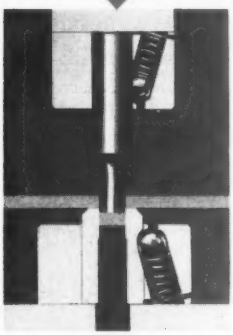
There is no better way to test the whole in a wheel than to insert a round plug gage into it. This plug gage should be similar to the arbor on which the wheel will eventually be mounted by the user.

(Continued on page 110)

Special Punches *with* Standardized R-B Features







Save time in die designing, construction and use by adopting as your tooling standard the most widely accepted piercing system in the industry. This standardized R-B concept of interchangeable punches and die buttons will efficiently answer your needs on both simple and complex applications.

The standardized R-B ball lock in special or standard retainers gives positive radial alignment to all R-B punches and mating dies without additional keying. This same spring loaded ball lock permits quick changing of punches yet holds them securely in place.

Special punch-points of any shape or size can be made to your specifications and these punches will have all the desirable features of standard R-B equipment. Also, R-B guarantees continuing benefits from standardization by manufacturing each punch and die button to print dimensions, thus insuring identical replicas when replacements are required.

TOOL STANDARDIZATION IS THE BASIS FOR EFFICIENT AND ECONOMICAL PRODUCTION. WITH R&B YOU GET THE ACCEPTED STANDARD OF THE SHEET METAL INDUSTRY —IN STANDARD DESIGN FEATURES THAT SAVE IN ENGINEERING, DIE CONSTRUCTION AND OPERATION.

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Also Produced in Allied's Four Plants HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS • SHEET METAL DIES • ALLITE DIES CAST OF ZINC ALLOY • JIGS • FIXTURES

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Screw Machines, from page 89

many types. Some of this is commercially available equipment; but, a great deal of it is of our own design and manufacture. There is nothing fancy about this equipment, since advantages and benefits to be gained from the use of it can be quickly offset by unnecessary expenditure of board, toolmaking and setup time.

On typewriter parts, we have so developed and have in use some 50 specialized hopper feed and magazine feed attachments. Basically, the function of these attachments is quite simple: it is to utilize—on an operation which might normally be expected to be carried through with substantial manual work—the full automatic potential of the machine through mechanical handling or transfer means integrated within the automatic.

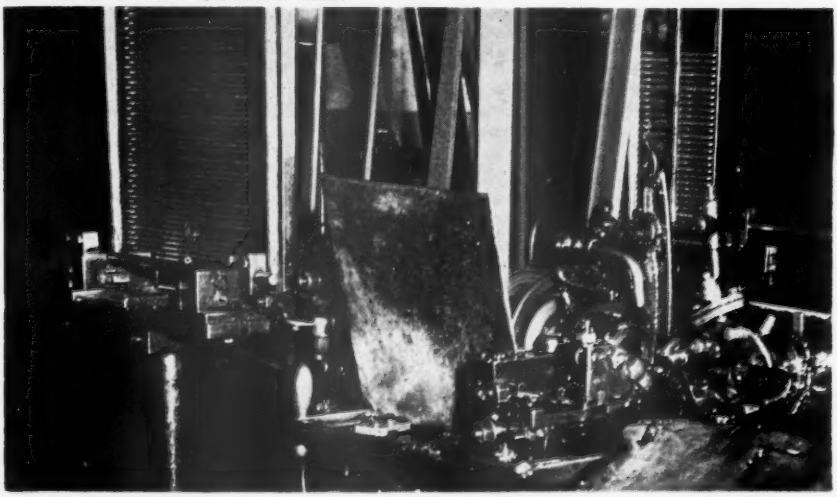
Usually, the means devised is specialized to a given part; but we have, in this area, been able to standardize to some extent by adapting some machines to more than one of these applications. Interestingly enough, these results have been accomplished without substantially taking from the machine unit its universal potential.

Examples of the savings inherent in the use of hopper or magazine feeds can readily be cited to show such figures as 60% increases in output on some jobs, the possibility of assigning one operator to three hopper-fed units rather than one hand-fed unit, and the elimination of relatively expensive hand-fed secondary operations on other types of machine tool equipment.

I might cite, however, another face to this program that merits some comment. We have run into the situation where—in order to take care of defense commitments, and particularly on ammunition components—we have had to free up machine units of a given type for a defense job. This has been done in a few instances by removal of the special attachment used for the typewriter job, in order to make the basic machine unit suitable for the war job. The typewriter part schedule must then be realized by multiple shift production on a machine unit not so equipped, and impractical to so equip.

In closing, it is the men who—to a very large degree—make possible whatever success is achieved. We are fortunate to have many employees with long records of Underwood service. Though machines outnumber men in this manufacturing division, the key to our progress rests with the man on the job—his loyalty and his industry.

No. OO B&S Automatic equipped with Special Magazine Feeding Attachment for secondary rod work, roll feeding attachment, and cutout turret for long lengths, up to 40". Operator runs several machines on incentive (piecework) basis.



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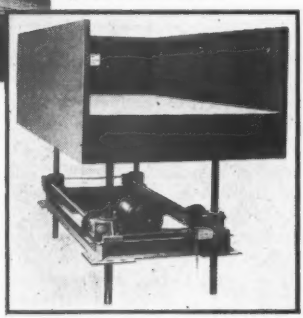
SHEET FEEDING METHOD IMPROVES MANUAL

effectiveness 800%

Portelvator material positioning units in operation.

Portelvator material positioning equipment supplementing micro grinders on plastic sheet sanding, produces astounding increase in manual effectiveness with corresponding benefits to production and production costs.



Portelvator material positioning unit before installation.

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THE Hamilton TOOL COMPANY

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. SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . **Grinding Wheel, from page 106**

The exact hole diameter need not be known. Therefore, it is customary to inspect the hole with go and no-go plug gages. If the hole in a wheel has a nominal size of 12", a plug gage whose diameter is not under 12.000" must enter the hole and another plug gage whose diameter is 12.009" must not enter.

Internal micrometers cannot be conveniently used to measure hole diameters of grinding wheels because of the porous structures and surface roughness. When the hole diameter is tested with a plug gage, as in the above example, the hole diameter is known to be somewhere between 12.000" and 12.009" *as measured with a plug gage.*

Obviously the hole must be larger than the arbor if the wheel is to be easily mounted. A wheel with a hole 12.000" diameter will not fit on an arbor 12.000" diameter. How much larger should the hole be to fit "easily" on the arbor? The answer to this question may depend upon how nicely the hole is machined. If the hole is bushed with metal or organic materials, a closer fit can be tolerated than if the surface of the hole is rough. Usually the hole must be at least .004" larger than the pilot upon which the wheel is mounted. The arbor or pilot should be smooth and free from scoring.

The purpose of the hole in a straight grinding wheel is to provide ease of mounting. After properly mounting a wheel between flanges on a grinding machine, the hole ceases to be of any value.

There is a mistaken notion that wheel should fit *tightly* on the arbor or sleeve. It should *slide on freely.* The fact is that a wheel with an oversize hole is a safer wheel to use than one where the hole fits snugly. The flanges, however, should be snug since the wheel is driven by the flanges, not by the hole.

It is common practice among grinding machine manufacturers to make the grinding wheel flange pilots undersize. A common dimension for the pilot mounting a wheel with a 12" hole is 11.998" to 12.000" or as usually expressed 12" + .000 — .002". In the course of using, the pilot gradually wears smaller. It is not uncommon to find them worn as much as .005" under nominal size.

Grinding wheel manufacturers are confronted with requests to make wheels with holes to fit users' equipment with enough oversize to permit wheels to be mounted readily and yet without an excessive amount of oversize in the hole resulting in out of truth and poor balance conditions.

A careful operator will always make it a point to mount his wheel centrally so that all the oversize of the hole will not be on one side of the arbor. In addition he will take the precaution to *first rough true the wheel* on his machine before testing it for balance. If these two steps are taken, good grinding results are assured, with safe operating conditions.

In this article it has been shown that if the wheel is mounted eccentrically, the wheel assembly will be so slightly out of balance as to be insignificant. Another very interesting situation arises when such a wheel is trued so that the periphery runs true with the center of rotation of the grinding wheel spindle. We will then have the case of a nonsymmetrical wheel, the hole being off-center. The resultant out-of-balance condition will be improved, but the assembly will still be somewhat out of balance. This problem will be discussed in a subsequent article.

Wax-Cut in Concentrated Form

Wax-Cut, a new type compound that improves metal-cutting action and reduces tool wear, now is available in concentrated form so that users may prepare their own cutting solutions and thus reduce costs, the manufacturers have announced. Wax-Cut Concentrate, a blend of special waxes, can be mixed 10 to 1 with any type of oil, including reclaimed motor oil, and paraffin and sulphurized oils.

When diluted, Wax-Cut Concentrate serves as a wax-fortified cutting fluid that can be used in automatic screw machines, gear hobbers and cutters, milling machines and oil-type grinders.

Because the concentrate can be mixed with any inexpensive oil, it substantially reduces the cost of the wax-base cutting fluids that reduce tool wear and permit cooler, cleaner metal cutting operations.

Tests have demonstrated that certain waxes in combination with other materials have excellent lubricating properties. Also that increased feeds and speeds are made possible, with less smoking, better machined surfaces and less loss of cutting fluids through burning and automization.

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C 1A, 4C 5C

480 (AC-50)

All collets in hexagon, square and round.

KLUTCH-KOLLET Step collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR ½" cap.

Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

HAND DRAWBAR ½" cap.

LIVE CENTER (Ball Bearing) Double sealed for accuracy.

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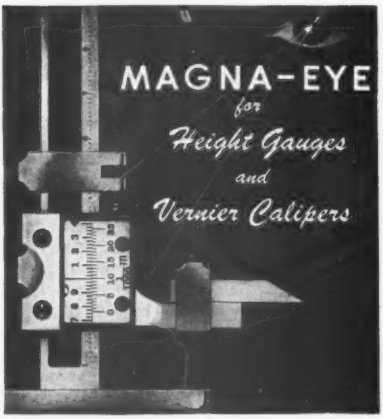


New, Improved

MAGNA-EYE

. . . for Accurate, Effortless Reading of Vernier Scales on Height Gauges and Calipers.

The New Improved MAGNA EYE is a highly perfected precision instrument. It permits the user to view the hard-to-read vernier scales without eye strain or effort, eliminates errors — no more hit and miss reading; plugging and unplugging eye cups, eye loops or any other magnifying device. Only with MAGNA-EYE is it possible to read the vernier scale with both eyes open in the same position as your book or newspaper. MAGNA EYE is a time saver in any shop turning out high precision work.

Magnifies four times — MAGNA EYE is not an ordinary magnifier — it is optically perfect glass lens especially designed and developed to meet all requirements in reading the vernier scale — is provided with a focus limit stop to meet the individual vision requirements. It is built to last the life of the tool for which it is designed. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many, many others.

Made in three sizes to fit Starrett, Brown & Sharpe, Lufkin and other tools of similar design — S #100 for 6" vernier calipers; S #200 for 10"-12" height gages also 10"-18"-24" vernier calipers; S #300 for most popular type 18"-24" height gages and 36"-48"-60" calipers.

ASK FOR DEMONSTRATION IN YOUR OWN SHOP — WRITE, CALL OR WIRE

STEBAR COMPANY
711 West Lake Street
MINNEAPOLIS 8, MINN.

. . . Beryllium, from page 104

required than are needed for deep drawing brass. The clearance between punch and die is usually slightly greater than the stock thickness and may exceed the blank thickness by 5 to 10 per cent. When permitted by design considerations, large radii on both the punch and die will facilitate drawing.

Depending upon the length of the production run, cemented carbide, air hardening steel or oil hardening steel can be employed as die materials. Carbide or chromium plated dies can be depended upon to give reduced friction and a better surface finish by means of the decreased tendency to score or to plate copper on the die. Chromium plate may also be employed in building up worn dies and to protect points of hard wear where the use of carbide is not possible. Dies should be carefully lapped and polished to reduce friction. Grinding marks should run parallel to the direction of metal flow. For best results, a well polished surface should be used, while galling can be reduced with a high polish and proper lubrication. Cadmium plated strip may prove advantageous for long runs.

In certain instances, production dies for handling beryllium copper can be relatively inexpensive, even for complicated shapes. For example, the main expense in making diaphragm dies is the cost of producing matching halves with the proper fit between corrugations. By employing a rubber half die, only one side of the die is made and the material is formed between this and the rubber backing. As a result, die construction may be simple and inexpensive. For diaphragms having concentric corrugations, the complete die can be turned on a lathe.

In considering drawing lubricants, soap and water gives good results and can be readily removed by washing in warm water. For the severest operation, it may be necessary to consider lard oil or a heavy soap paste containing solid lubricants to obtain needed film strength. Since sulfurized oils will stain beryllium copper parts, they must be immediately cleaned. Drawn parts should be immersed as soon as possible in a suitable solvent (Stoddard Solvent) to prevent staining. If a solvent is not used and the material stains, the discoloration can be removed by leaving parts for twenty to thirty minutes in a cold bath of 10% sodium cyanide. Extreme caution should be observed, however, in handling sodium cyanide.

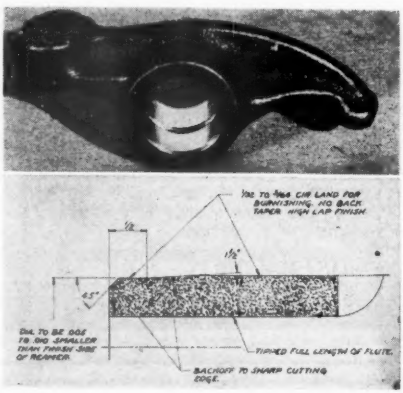
In selecting a drawing lubricant, some consideration should be given to the ease of removal and the possibility of staining. Prior to drawing, the strip should be carefully inspected to insure freedom from oxide film or scale, otherwise the die life may be seriously impaired.

A New Reamer Grind Developed

A new grind on "flute long" carbide tipped reamers, has been developed by the Super Tool Co. of Detroit. This new method of grinding enables users to rough and finish ream and burnish in one operation. The reamer is ground .005" to .010" undersize the first half inch and builds up to finish ream size. Above the finish ream section, lands are circular ground for burnishing to produce a micro finish. The "flute long" reamer is carbide tipped the full length of the flute.

In production tests, this new grind has proved its value by producing a finish of 25 micro reading for as many as 1000 pieces in malleable iron production parts where previously, finish could not be held to more than a few pieces.

Circle Inform-A-Gram No. D1.

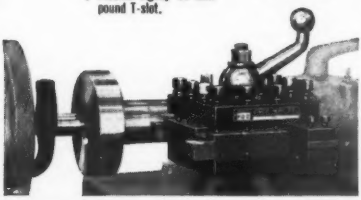

1/32 TO 1/64 CIR LAND FOR BURNISHING. NO BACK TAPER. HIGH LAP FINISH.
1/2
1 1/2"
45°
DIA. TO BE .005 TO .010 SMALLER THAN FINISH SIZE OF REAMER.
TIPPED FULL LENGTH OF FLUTE.
BACKOFF TO SHARP CUTTING EDGE.

Enco

TURRET TOOL POSTS SAVE VALUABLE SETUP TIME

The three photos at right illustrate the flexibility of 12-position indexing, whereby each tool may be used in three different working positions.

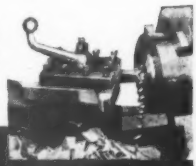
- √ Accurate within .0005.
- √ 12 position indexing.
- √ Hardened steel construction.
- √ Mounts rigidly in compound T-slot.
- √ Keeps setting accurately.
- √ Indexing is self-contained—eliminates all chip-interference.



Also Mfg's. of complete line of Hexturrets and "MITI-MITE" Magnetic base tools. Send for Latest Catalog.

¾" square tool bit mounted in Model 4½-S turret used for facing cut.

The same tool used for broadface turning merely by indexing turret one position or 30°.



Same tool used for inside chamfer merely by indexing back two positions or 60°.

ENCO *Manufacturing Co., Dept.* 7112
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Victor's Specials Deserve Your Attention!

ECLIPSE ANGLE PLATES

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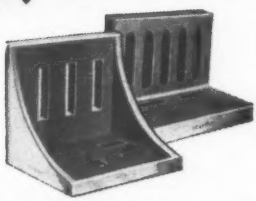

Eclipse Angle Plates are available in "Webbed End" and "Open End" patterns. Made from high quality castings and seasoned before machining to prevent distortion. All faces of Open End and outside faces and edges of Webbed End patterns are machined square and parallel.

Webbed	Cost	Length	1st Angle	2nd Angle	Open End	Cost
#199	$2.50	3"	2½"	2"	....	....
#200	3.25	3½"	3"	2½"	....	....
#201	4.25	4½"	3½"	3"	#301	$5.50
#202	5.50	6"	5"	4½"	#302	7.75
#203	7.00	7"	5½"	4½"	#303	9.25
#204	9.00	8"	6"	5"	#304	11.50
#205	11.50	9"	7"	6"	#305	14.50
#206	17.00	10"	8"	6"	#306	18.50
#207	22.00	12"	9"	8"	#307	24.00

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Press Standardization From A Press Builder's Viewpoint*

The need for standardizing the die mounting dimensions of mechanical presses, in order to facilitate interchangeability, was recognized in 1946, by a working group of the General Motors Mechanics Committee following the establishing of GM Standards on Die Sets.

Several meetings of the working group were held to discuss standardization and simplification of the die mounting dimensions of various makes of presses. Tentative proposals were drafted and in August 1946, other large users of mechanical presses in the Detroit area were asked to participate in this program, thus, instituting a Joint Industry Conference User Group activity.

Several subsequent meetings of the Joint Industry Conference User Group were held, and on March 20th, 1947, the first joint meeting with the Press Builders took place. A number of meetings of the Joint Industry Conference User Group and joint meetings with Press Builders have been held since March 20th, 1947, all of which have culminated in the establishment of the following Joint Industry Conference standards of mechanical presses:

1. Open back, inclinable presses
2. Straight side, single action, single point presses
3. Straight side, single action, multiple point presses
4. Rail or frame presses
5. Double action, single and multiple point presses
6. Triple action, multiple point presses

Rules Regulating the J.I.C. (Joint Industry Conference) Activities

The following outlines the manner in which J.I.C. (Joint Industry Conference) is conducted and my purpose is to acquaint you briefly with as much information as is possible to those of you who have not previously participated in these activities.

The purpose of the Joint Industry Conference is to bring together engineers

*This paper was delivered recently before the Annual Meeting of the Pressed Metal Institute. Our thanks to PMI for permission to pass this information on to our readers. Ed.

LEVIN
MICRO-DRILL PRESS
for holes as small as .002"
Designed to hold small drills in precision collets. Absence of a sliding quill guarantees extreme sensitivity with finger-tip control. A mounted ⅛" capacity drill chuck can also be used.
Write for Bulletin H describing the Micro-Drill Press and listing collet sizes. Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21, California.

and technicians representing both user and supplier groups to discuss common problems on an industry-wide basis. By arriving at solutions to these problems, standards or specifications can be formulated which serve as guides to both the user and supplier groups in providing facilities which will promote safety of personnel, uninterrupted production and long life of equipment, but which will not limit or inhibit advancement in the related fields.

There is no specific membership comprising these activities; these conferences are held as open forums. No agreements are ever made to abide by the findings of any group. Problems pertaining to any such activities are placed before and investigated by engineers and technicians so that solutions may be arrived at which are beneficial to all concerned.

Any specification or standard published as a J.I.C. item has the approval of all attending the subject conference.

It is recognized that an Industry Conference may be held by any company or a series of such conferences may be sponsored by any one interested. The responsibility of coordinating may be rotated among those interested.

Since Joint Industry Conference (J.I.C.) are open meetings which all who are interested are welcome to attend, specifications developed will only be published when the User Group is in agreement that the standards developed represent the best known solutions to the problems. At such meetings by determination of those participating, working groups may undertake additional investigation, study or experimentation needed to obtain further information. Information developed by

by E. A. Irwin
E. W. BLISS COMPANY
Canton, Ohio

such group, or groups, may be presented as draft or proposed standards at the next general Joint Industry Conference of the over-all user and/or Press Builder group.

Methods of Procedure at Meetings Held by Both Groups of J.I.C. to Arrive at Standardization

While standardization of electricals, hydraulics and pneumatics has been cov-

(Continued on page 128)

FOR PRECISION
Carbide Finishing
ELGIN DIAMOND
IN DYMO-C
...Designed for Carbides!
Where precision really counts, finishers specify ELGIN Diamond because they can be sure of:
• consistant accuracy—uniform cutting action
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Actual field tests prove this new diamond abrasive up to 20% faster for finishing carbides.
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ELGIN NATIONAL WATCH COMPANY
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MEN YOU SHOULD KNOW . . . . . .

A. DONALD KELSO

HERBERT A. STANTON

EUGENE V. IVANSO

RAYMOND DEARTH

★

A. Donald Kelso, 54, Westport, Connecticut, executive vice-president and director of Norton Behr-Manning Overseas, Inc., today became president of that company succeeding Herbert A. Stanton, of Worcester, who is retiring. An expert on foreign markets, Mr. Kelso has been in the coated abrasives business since 1921. He was named executive vice-president of Norton Behr-Manning Overseas, Inc. in 1951. Mr. Stanton entered the employ of Norton Company in 1912, and has since held a variety of executive posts. After retirement his address will be Wequasset Rd., Harwichport, Mass.

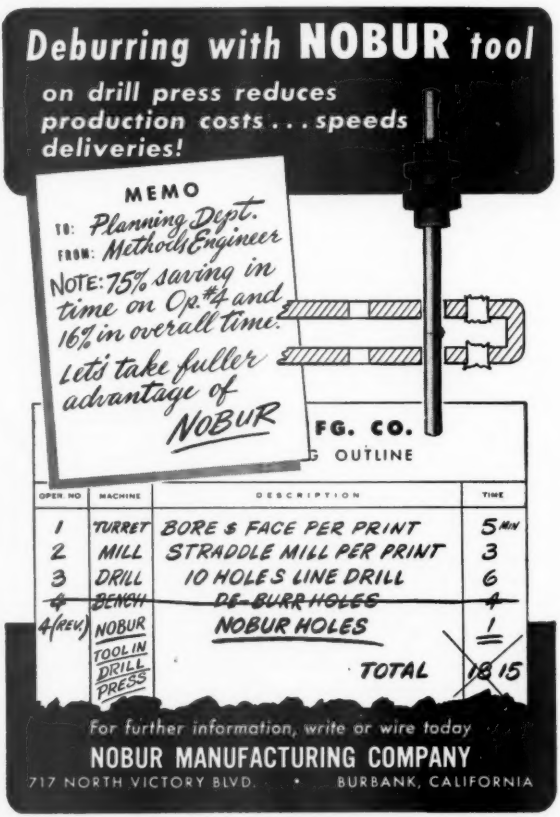
★

Eugene V. Ivanso has been named head of metallurgical engineering and research at the Detroit Testing Laboratory, 554 Bagley, Detroit 26. Ivanso has been a metallurgical engineer in Detroit for 16 years, variously affiliated with Bundy Tubing Co., Wyandotte Chemicals Corp., and Steel Sales Corp.

★

Mr. Raymond Dearth has joined the Udylite Corp. as Sales Engineer for the Northern Indiana area. He spent 5½ years with the U. S. Army during World War II, before which he was associated with both the U. S. Rubber Co. and the Firestone Tire & Rubber Company.

★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on drill press reduces production costs . . . speeds deliveries!
MEMO
TO: Planning Dept.
FROM: Methods Engineer
NOTE: 75% saving in time on Op. #4 and 16% in overall time.
Let's take fuller advantage of NOBUR
FG. CO.
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1 TURRET BORE & FACE PER PRINT 5 MIN
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3 DRILL 10 HOLES LINE DRILL 6
4 BENCH DE-BURR HOLES 4
4 (REV.) NOBUR TOOLIN DRILL PRESS NOBUR HOLES 1
TOTAL 18 15
For further information, write or wire today
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. . . . . MEN YOU SHOULD KNOW

E. E. McALLISTER

D. J. JONES

ERNEST J. MEUTEN

JOHN L. YOUNG

★

Firth Sterling, Inc., Mining Div., has appointed E. E. McAllister as salesman to represent them in the Princeton, W. Va. territory. Mr. McAllister has had 18 years experience in the coal mining industry. Before coming to Firth Sterling, he was employed by the Peabody Coal Corp., as foreman, and by the Old Ben Coal Corp.

★

D. J. Jones has been appointed general sales manager for the Honan-Crane Corporation, Lebanon, Indiana. He has been associated with the Honan-Crane Corp. since 1948, starting as a resident engineer in Kansas Mo., and as district manager for the entire eastern sales territory. He is a graduate Mechanical Engineer from the University of Nebraska.

★

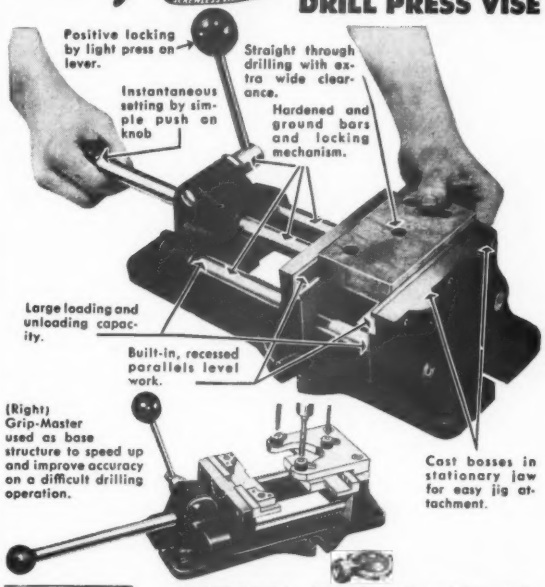
Ernest J. Meuten, assistant secretary and assistant treasurer of the Pratt & Whitney - Chandler - Evans Division of the Niles-Bement-Pond Company was recently elected a director of the Controllers Institute at the organization's 21st Annual Meeting. Mr. Meuten was last year president of the Hartford Control.

★

John L. Young, vice president in charge of engineering for United States Steel Co., has been elected president of the Association of Iron and Steel Engineers for 1953. He has since been associated with many of the industry's important concerns.

Speed-up DRILL PRESS OPERATIONS

WITH THE HEINRICH *Grip-Master* SCREWLESS DRILL PRESS VISE


Positive locking by light press on lever.
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Straight through drilling with extra wide clearance.
Hardened and ground bars and locking mechanism.
Large loading and unloading capacity.
Built-in, recessed parallels level work.
Cast bosses in stationary jaw for easy jig attachment.

(Right) Grip-Master used as base structure to speed up and improve accuracy on a difficult drilling operation.

Ask your dealer for demonstration or write for details.

NATIONAL MACHINE TOOL CO.
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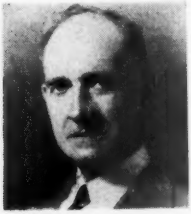
MEN YOU SHOULD KNOW . . . . . .



HARRY E. SLOAN, Sr.

HARRY E. SLOAN, Jr.

Col. JOHN FRYE

HELMUT THIELSCH

★

At a meeting of the board of directors of the Cushman Chuck Co. Mr. Harry E. Sloan, President of the Company since 1928, was elected chairman of the board. Mr. Sloan will complete 53 years of consecutive service this fall. He has been a director of the Company since 1914, and served also as treasurer before 1939. Harry E. Sloan, Jr., who has served under his father as vice president and secretary since 1939, now becomes president. Mr. Sloan Jr., director of the company since 1938, joined it in 1937 and is a graduate of the Sheffield Scientific School at Yale, class of 1936.

★

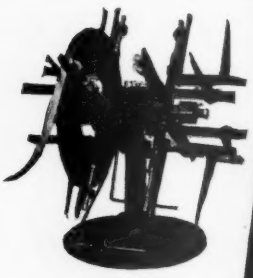
Col. John Frye, completing a tour of duty in Washington, has been reappointed manager of sales of Columbia Steel & Shafting Company and its Summerhill Tubing Co. Division, Carnegie, Pa. Except for two breaks on army service, Col. Frye has been associated with the Columbia family since 1928.

★

The appointment of Mr. Helmut Thielsch, formerly of the Welding Research Council, to the position of director of applied welding engineering at Eutectic Welding Alloys Corp., Flushing, New York was announced in July by R. D. Wasserman, President.

★

LESS DOWN TIME, MORE PRODUCTION FROM PUNCH PRESSES FED BY



LITTELL DOUBLE AUTOMATIC CENTERING REELS

Vital minutes are saved, with practically no down time for coil replacement, when a Littell Double Reel uncoils stock to the punch press. The idle side of the reel is loaded while the other side pays out. When a coil is used up, the operator simply lifts the hub lock pin, then swivels the reel 180°, thus placing the reserve coil in press feeding position. The changeover is complete in a few seconds. Like Littell Single Reels, Littell Double Reels combine balance that means smooth running accuracy with rugged malleable iron and steel construction that assures year in, year out dependability.

FOUR SIZES
No. 3 . . . . . for coils up to 300 lbs.
No. 5* . . . . . for coils up to 600 lbs.
No. 10* . . . . . for coils up to 1,000 lbs.
No. 25* . . . . . for coils up to 2,500 lbs.
*Can be furnished with motor drive

Write for catalog

F. J. LITTELL MACHINE CO.
ROLL FEEDS • DIAL FEEDS • STRAIGHTENING MACHINES • REELS • AIR BLAST VALVES
4197 N. RAVENSWOOD AVE., CHICAGO 13, ILL.
District Offices: Detroit, Cleveland

. . . . . MEN YOU SHOULD KNOW

B. PRATTE

MILTON F. BEECHER

HARVEY T. HARRISON

G. A. BAKER

★

B. Pratte, a veteran of nearly twenty years with Harnischfeger Corporation, Milwaukee, has been appointed general sales manager. He joined the company as a sales trainee after graduation from Marquette University in April 1933. He will be in charge of all domestic branch operations, excluding the Pacific Division whose activities he will help coordinate with the overall sales and service policy.

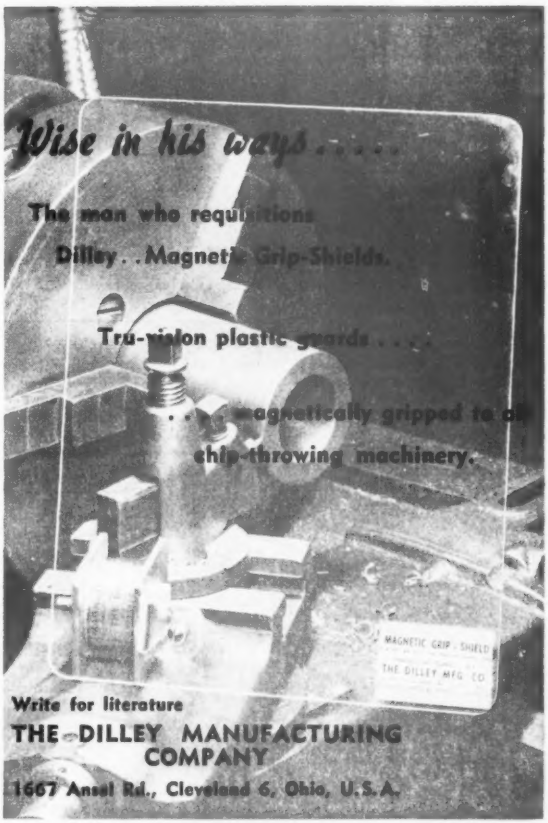
★

Milton F. Beecher, head of Norton Company's research and development laboratories since 1941, retired as vice president and director two months ago. During his 37 years association with the company, Mr. Beecher has been responsible for the guidance and direction of many important Norton inventions and developments. He is one of the pioneers of ceramic engineering.

★

At the twelfth annual convention of the Alloy Casting Institute held recently at Hot Springs, Virginia, Mr. Harvey T. Harrison executive vice-president, the Duraloy Company, Scottdale, Pa., was re-elected as President. Mr. G. A. Baker, vice-president, The Duriron Company, Dayton, Ohio, was elected as the new vice-president.

★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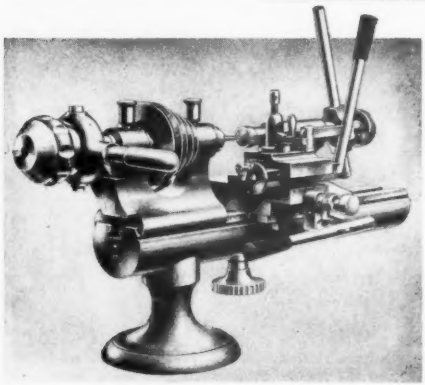
Traveling Cylinders

Imparting valuable knowledge on the proper use, maintenance, operation and testing of air and hydraulic cylinders to further the greatest possible efficiency and service life is the aim of the fleet of mobile "College of Cylinder Knowledge" units now being put on the road by Miller Motor Company, Chicago area manufacturer of cylinders, boosters, and accumulators.

The new fleet is a result of the remarkable success of the original "College". However, the new fleet units are converted busses that require no towing and are easily driven, operated, and maintained by one man with much greater economy. Like those in the original "College", the bus exhibits are designed primarily to instruct and enlighten visiting personnel and consist of cylinders in actual operation. How to obtain leakproof operation and up to 98% plus operation efficiency and how cylinder users and buyers may quickly and easily test cylinders at almost negligible cost before installation are just two of the worthwhile "eye-witness" demonstrations to be seen. One special exhibit presents a very striking example of the modern development of dual pressure boosters for saving air, space, weight, cutting costs and increasing efficiency in developing up to 10,000 psi hydraulic output from ordinary plant air for particularly advantageous use in punching, welding, pressing, crimping, shearing, clamping, riveting, and similar applications. Another exhibit shows how air and oil can be combined in one cylinder unit to give the smooth, precision-accurate, chatter-free movement of hydraulic power from ordinary plant air input.

The Fleet of "Mobile Colleges" are rotated among company representatives so that each man has the use of a unit for weeks at a time which he drives it right into or near industrial plants by pre-arranged appointments, and, as the "College Professor," demonstrates, explains, and instructs before visiting groups of design, engineering, production, and maintenance men. The fleet units have already played host to the nation's leading industrial companies.

Pivot Punch Expands: As the fifth expansion in two years, during which time the number of employees increased from 72 to 205, Pivot Punch & Die Corporation, of N. Tonawanda, N. Y., announces the purchase of a 17 acre tract of land and the immediate construction of a building to be devoted to the repair and rebuilding of machine tools as a new service of the firm. Edward Huntzinger, Works Manager, supervised the construction of the new plant, which was in operation within nine weeks after it was staked out.



New Low-Priced Precision Lathe Announced. This 12" bed general purpose watchmaker's and experimental precision lathe has just been announced by Henry Paulson & Co., 131 S. Wabash Ave., Chicago 3, Ill. Features include full nickel plating, hardened steel taper ground adjustable bearings, plus oversize oil cups that assure an adequate six months supply of lubricant to the bearings, promising a life-time of accurate and dependable service. Accessories include a four-stop quick change automatic centering and chuck releasing turrethead, adjustable to a fraction of a millimeter; compound vertical and horizontal slide rests with lever and calibrated screw feed; wheel cutting and milling attachments; pivot polishers and numerous other precision production tools. An 8 page illustrated catalog has full data.
Inform-A-Gram No. D2.

. . . Carbide Tooling, from page 86

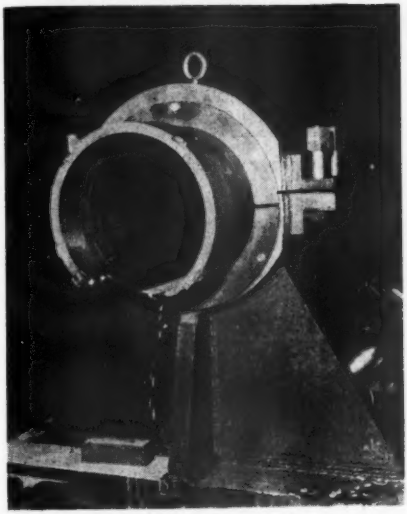


Fig. 5. Triple edge tool set up in a 24" trepanning head. Four wear pads on side of trepanning head guide the cutting tool during operation to assure a true hole. The resulting 21½" dia. core is used for smaller dia. parts, thus providing a worthwhile saving in essential material.

tend the lathe bed and install a 40-horsepower motor.

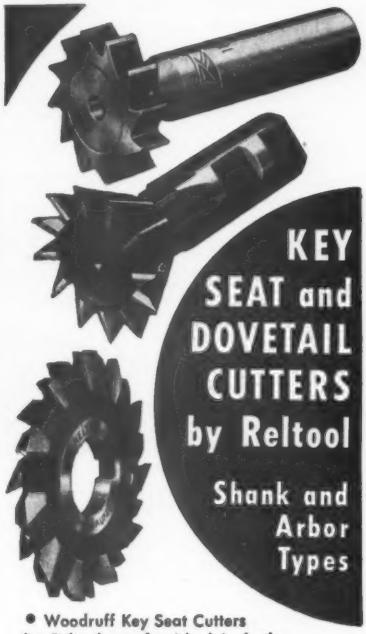
Rolls are bored halfway through, reversed and then bored from the other end. The two holes meet at the center with negligible runout.

Tools are touched up after each penetration regardless of condition to assure longer life and smoother performance. Boring halfway through these large rolls represent over forty miles of lineal cutting per grind.

A typical operation is shown in Figure 6 in which a 12-foot long 21½-inch diameter roll—a core from a previous cut—is being trepanned to 15¼ inches inside diameter by removing a 12¾ inch diameter core. The carbide tool cuts at 56 rpm and 0.008-inch feed.

Trepanning bar is a stationary tube with the single tool mounted as shown in Figure No. 5. Four wear pads shown on the side of the trepanning head guide the cutting tool during operation to assure a

(Continued on page 132)



• Woodruff Key Seat Cutters by Reltool are furnished in both Shank and Arbor Types. Right Hand Cut, shank type, carried in stock; Left Hand Cut, *special*. Arbor Type Keyseat Cutters have staggered teeth, with side teeth relieved for narrow margin.

• Reltool Dovetail Cutters, Shank Type, are designed to take the place of arbor type and threaded hole angle cutters . . . for use in Reltool End Mill Holders.

The RELTOOL Line Includes: Combined Drill and Countersinks • Cut-off Blades • Die Sinking Cutters • Dovetail Cutters • End Mills • End Mill Holders • Hollow Mills • Key Seat Cutters • Lathe Centers • Lathe Mandrels • Machine Countersinks • Metal Slitting Saws • Milling Cutters — all types • Screw Slotters • Tool Bits • Specials.

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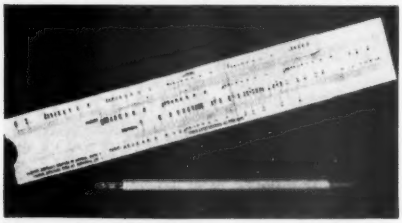
Illustration Shows New Improved Slide Rule Weight Calculator for flat sheet material just announced by the Dayton Rogers Mfg. Co.,



Minneapolis 7, Minnesota. It will quickly give the exact weight of stock requirements for the production of stampings. The calculator is also provided with constants giving the conversion figures for obtaining the weights of sheet metals other than steel.
Circle Inform-A-Gram No. C1.

Metal Cutting With Victor is title of new brochure recently issued by Victor Saw Works Inc., Middletown, New York. Sections in the booklet are divided into three subjects: hand hack saw sawing; power hack saw sawing; and band sawing. Within each of these divisions are hints on blade types and selection for different jobs, trouble shooting hints, and correct general usage. Direct and easy to understand.
Circle Inform-A-Gram No. C2.

New Holding Method taking advantage of the elastic properties in metal is described in bulletin 17-50 from Scully-Jones & Co., 1913 So. Rockwell St., Chicago 8. 52 pages of engineering information, drawings, and tables help you to cut your shop tooling costs and increase production.
Circle Inform-A-Gram No. C3.

Application Data, Heat Treatment Recommendations, weight tables and other helpful information on a full range of tool and die steels is offered by the revised Latrobe "Pocket Handbook" from the Latrobe Electric Steel Co., Latrobe, Pa. Included is data on various Electrite high speed steels; non-deforming die steels; oil hardening die steels; hot work die steels; punch, chisel and shock steels; water hardening and carbon tool steels.
Circle Inform-A-Gram No. C4.

Volume 43, No. 8 of Grits & Grinds from the Norton Co., Worcester 6, Mass., includes articles of more than ordinary value on the care and treatment of diamond wheels and sharpening procedures for cast alloy and high speed steel lathe and planer tools. Section "Between Centers," has trouble shooting article on rough grinding finish and uneven wheel surface.
Circle Inform-A-Gram No. C5.

"Modern Material Handling" is title of a brochure now available from the Edison Storage Battery Div., Thomas A. Edison, Inc., West Orange, N. J. Sections discussed include the unit-load method, power requirements of industrial trucks, and the power characteristics of Nickel-Iron-Alkaline storage batteries.
Circle Inform-A-Gram No. C6.

Precision Tap Sharpening, its "Whyes and Wherefores," is discussed in a reprint offered by the Edward Blake Co., Dept. N-TP, 437 Cheery Street, West Newton 65, Mass. Charts and diagrams, textual facts and figures are aid in evaluating the precision sharpening method for use in your plant.
Circle Inform-A-Gram No. C7.

Magnetic Alloys Described in New Booklet. An 8-page "what is it," "where to use it" booklet No. TD-52-100 is now available from Westinghouse Electric Corp., Box 2099, Pittsgurgh 30, Pa. Physical and magnetic property tables, heat treatment techniques, and core loss and magnetization curves make the booklet very valuable for choosing alloys and matching choice with specific application.
Circle Inform-A-Gram No. C8.

Wendt-Sonis Chip-Breaker Chart Includes engineering drawings, table of constants for determining chip breaker widths under different cutting conditions, a grinding summary, and hints. All necessary data presented in eye-catching form, tinned top and bottom with loop. Wendt-Sonis Co., 10th and Collier Sts., Hannibal, Mo.
Circle Inform-A-Gram No. C9.

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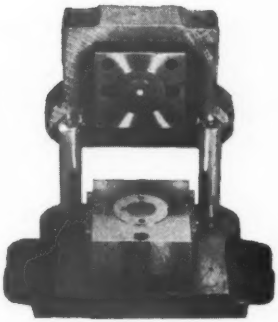

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

Safety Code for Forging Operations

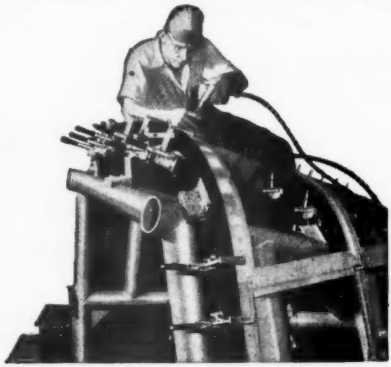
A safety code embodying provisions for safety in the use of power-forging machinery for both drop forging and flat-die forging has been approved by the American Standards Association.

The code applies to all classes of power-forging machinery and incidental operations and equipment in connection with such machinery. General requirements are given for working and aisle space, construction of platforms, lighting, head and foot protection, and safety clothing and safety devices. Specific requirements are included for all hammers, steam and pneumatic hammers, mechanically operated hammers, board drop hammers, and other machines, such as hydraulic presses, cold-trim presses, hot saws, etc. Special provisions are also given with respect to furnaces—the hood, insulation of sides, and pressure release devices.

Accompanying the code is an illustrated appendix giving pictorial evidence of some of the items mentioned in the code, such as location of controls, working platforms, guards, safety devices, positioning of equipment, and the like.

The code, which is a revision of a 1927 edition, is consistent with up-to-date forging practices and operations. Its provisions are recommended for adoption by state labor departments in order that there may be uniformity of requirements throughout the country. The code is also

DESTACO
TOGGLE CLAMPS



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De-Sta-Co Toggle Clamps maintain efficient production of Fairchild C-119 "Flying Boxcars" at Kaiser-Frazer's Willow Run plant. KF engineers welded a small contact bar to the clamps and taped them to protect the skin surfaces of the main canopy. Model No. 210-S Toggle Clamps used on this welded fixture also provide precise alignment of the glass retainer of the canopy structure during the riveting operation. Rapid toggle action and ease of work removal make De-Sta-Co Clamps the logical choice for this production application.

The same principles apply to your work holding problems in assembly, welding, bonding, machining or other production processes. Select from over 40 fixture or portable models. Positive holding pressures up to 4000 pounds.

Write today for your copy of the De-Sta-Co Catalog describing available stationary and portable toggle clamps.

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designed for the voluntary adoption by individual forging companies and by insurance companies and other organizations concerned with industrial safety.

The National Safety Council and the Drop Forging Association sponsored the development of the standard under the procedures of the American Standards Association.

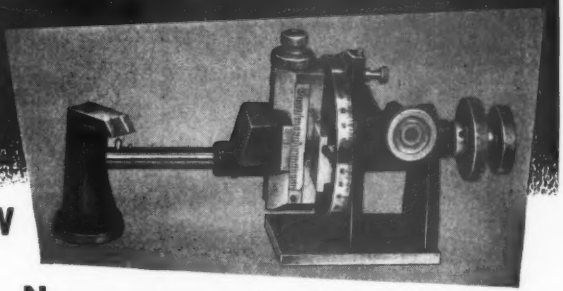
Organizations represented on Sectional Committee B24, which developed the safety code, were::

American Federation of Labor
American Society of Mechanical Engineers
American Society of Safety Engineers
Association of Casualty and Curety Companies
Congress of Industrial Organizations
Drop Forging Association
International Association of Governmental Labor Officials.
National Association of Mutual Casualty Companies
National Machine Tool Builders' Association
National Safety Council
Society of Naval Architects and Marine Engineers
U. S. Department of Labor, Bureau of Labor Standards

Copies of the American Standard Safety Code for Forging and Hot Metal Stamping, B24.1-1952, may be obtained from the American Standards Association, 70 East 45 Street, New York 17, at $1.00 per copy.

Set Up Angle-Tangent-to-Radius Forms

IN MINUTES



with the NEW

Now you can have precision within "tenths" and set up in *one-fourth* the time. Tangi-Matic has a direct-reading micrometer *built in*, eliminating "mikes", height gages, Jo Blocks *and errors*. Even novice operators obtain extreme accuracy. Tangi-Matic dresses any concave radius down to .032", full 180° with equipment we give you. Set-ups can now be made without removing dresser from your grinder chuck.

Our new model has *removable dressing arm*, permitting the use of extensions for dressing *large wheels*. Wearing surfaces are hardened, ground and lapped to a mirror finish, assuring you of years of extra service over ordinary dressers. Lead screw is hardened and ground to extreme tolerances. Furnished complete with master setting block, small radius attachment, plastic hood and carrying case. Write for literature and name of representative in your area.

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

Government Leasing Reserve Machine Tools; Seeking Customers

The "machine tool inventory center", operated by the National Production Authority, Department of Commerce, has inventoried 30,000 Government-owned tools, and since last May 12 it had leased 2,117 pieces of equipment to military and defense-supporting contractors hard-pressed to meet their production schedules for aircraft engines, tanks, shells, etc., because of the critical scarcity of many kinds of tools.

These 30,000 pieces of equipment represent the residual of tools which the Government was unable to dispose of after World War II. The tools had been purchased by the Government during the war period and loaned to military contractors. When war contracts ceased, the equipment was returned to the various owning Federal agencies and the Armed Services. Since that time, the unsold tools have been lying idle in storage depots, arsenals, Navy yards, warehouses and other concentration points.

In view of the current shortages of machine tools and related production equipment—shortages partly attributable to the extreme popularity of some types and sizes and partly due to the long lead-time factor in producting new equipment—these residual tools are being made available to military and defense contractors for expeditious completion of their jobs.

The "machine tool inventory," formally identified as PECIG (Production Equipment Central Inventory Group), reports that the 30,000 Government-owned tools have an estimated aggregate value at today's replacement costs of about $450,000,000. The 2,117 tools leased to date have an estimated replacement value of $39,730,000.

NPA's Metalworking Equipment Division took over operation of PECIG May 12 after the Central Inventory Group had been functioning since July 1951 under the Armed Services and the Munitions Board.

Since NPA assumed the responsibility of maintaining PECIG, 3,258 pieces of Government-owned equipment not currently in productive use have been allocated, and of this number, 2,117 pieces were found

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FRICTION sawing with Tannewitz High Speed Band Saws results in perfectly amazing time savings in the cutting of flat sheets of soft or hardened steels, non-ferrous metals, armor plate, glass, plastics, many other materials and the trimming of castings. For cutting formed parts there's nothing to compare with it. The down-drag of the saw is so negligible that parts may be trimmed or sawn as desired without using a rest of any kind. Whatever your cutting requirements, chances are they can be handled faster and at less cost with Tannewitz High Speed Band Saws.
THE TANNEWITZ WORKS
GRAND RAPIDS, MICHIGAN
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS
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acceptable by the various military and defense contractors. Acceptances have averaged 65 percent

NPA officials say: "We are eager to find thousands more of defense-supporting activities which, if they have been unaware of the availability of these Government tools, should immediately contact PECIG and screen its records to ascertain if the equipment they urgently need can be supplied to them."

Available for allocation to military and defense-supporting contractors are virtually every type and size of machine tool and related production equipment. These include general, single and special-purpose tools. PECIG files list boring machines, die sinking machines, drilling machines, gear cutting machines, grinding machines, lathes, milling machines, planers, shapers.

Most requests reaching PECIG, which it has been unable to fill, are those for general purpose tools that are largely scarce because of their widespread popularity and heavy demand for them. These hard-to-get units are those listed in Exhibit D of NPA Order M-41. Tools in this Exhibit are obtainable from producers only on rated orders and their production requires long lead-time.

Government agencies in possession of idle production equipment have been furnishing PECIG with the information necessary to establish and maintain the central inventory on a current basis. These agencies are providing for the expeditious shipment of such equipment in accordance with NPA allocations and shipping instructions, and arranging for leases.

Immediately after NPA took over operation of the machine tool inventory center, it solicited and obtained the cooperation of the nation's machine tool industry to help with the job of inventorying idle Government-owned equipment in storage depots, arsenals, Navy yards, warehouses and other points.

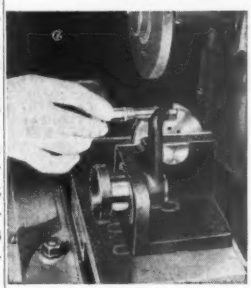
Survey teams of experts, loaned to NPA by machine tool builders, have visited storage sites where the Armed Services have metalworking equipment. These visits have resulted in the reporting of approximately 10,000 tools not previously available to the Central Inventory Branch, bringing the total to 30,000 items.

The residual of Government-owned tools are those belonging to the Air Force, Navy, Army, Maritime Administration, General Services Administration, Defense

(Continued on page 130)

YESTERDAY'S PIONEER - - - TODAY'S LEADER

WELDON



CIRCULAR FORM TOOL SHARPENING and MEASURING FIXTURE

The Weldon Circular Form Tool Sharpening and Measuring Fixture is a convenient and accurate aid in sharpening and measuring of all sizes of high speed steel or carbide tipped circular form tools. Insures maintaining the original shape of form tool by keeping proper relationship of cutting face to center line of tools.

The micrometer measures the correct distance the cutting face should be below center line of tool. The fixture may be used on any surface grinding machine.

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Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

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. . . Press Standardization, from page 115

ered by other groups of the Joint Industry Conference, this discussion will present principally the phase of work accomplished by the mechanical press section.

Press standardization has as its prime object, the standardization of die space, stroke, bed and slide areas and other dimensions essential to acquire the interchangeability of dies between all presses of like tonnage and die space areas regardless of press manufacturer.

As previously stated, the Joint Conference is divided into two groups; namely, the users and suppliers. Each of these groups are composed of those who have had considerable experience in their lines, and who are competent to consider and discuss each suggestion or question that is brought before its body. Any and all objections to any issue are given to a general discussion until each subject has the approval of all of the members present. By this form of open discussion, each member feels free to express his objection and knows that it will receive full consideration.

The agendum for a standardization meeting, in most cases, develops as follows: The users, in their group meeting, decide which type of machine is most urgently needed by their combined industries. They suggest a tentative list of dimensions and forward this information to the suppliers. The suppliers then have a meeting and approve, partially change, or completely change dimensions which in their opinion would make a better machine suited to this particular series. A general Joint Industry Conference meeting is then held and all dimensions are carefully checked. In necessary cases more changes are made until the final specifications have the concurrence of both groups.

The method of procedure, as outlined, in obtaining the standardization of press dimensions, the chemical and physical properties of various components by urging each user and supplier to express their opinions has been very successful. It is our hope that the cooperative spirit, which has prevailed, will continue until all standards covering mechanical presses have been set up under these J.I.C. meetings. We also urge all members of the Pressed Metal Institute to take an active part in these conferences, and at the completion of our standardization program, to endorse and use these press standards whenever possible.

A somewhat detailed ex-

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"DEEP CORE DESIGN"

Get more for your center dollar with Gorham "DEEP CORE DESIGN!" "M-40-U" Alloy Centers are PRODUCTION-PROVEN in the largest plants. They consistently outlast high-speed and other alloy centers, stand far more abuse. Although equal to carbide in wear resistance, they cost less, are easier to redress.

And Gorham's exclusive "DEEP CORE DESIGN" allows many more redressings, too! A core of "M-40-U" Alloy, developed by Gorham expressly for wear, abrasion and heat resistance, is induction brazed deep in the shank, after which the entire center is finish ground, giving you wear material permanently supported by tough shank steel!

Gorham "M-40-U" Alloy Centers are available with Morse, B. & S. or Jarno taper shanks. Immediate delivery on popular sizes, "specials" to specification. Free literature gives description, dimensions, prices. Send for your copy today.

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planation should be given to better acquaint you with the progress to date, in the standardization of the several types of presses.

Standard Tonnages of Presses

The following figures list the standard tonnages exerted by main slides for the various sizes of presses—75, 100, 125, 150, 200, 250, 300, 400, 500, 600, 800, 1000, 1250, 1600 and 2000.

All single action presses are designed with torque of gearing based on the maximum stroke of standard machines to give full tonnage ½-inch up from the bottom of the stroke.

Double and triple action main slides, with standard stroke, will exert full tonnage 1-inch from end of work stroke.

Double and triple action blankholders, with standard stroke, will give rated tonnage ⅜-inch before end of stroke.

Triple action, third slides are based on rated tonnage ½-inch from end of stroke.

Numbering of Presses

The numbering used on straight side mechanical presses is built up of four divisions, each forming a correlated description of the machine. The first designates the action, the second states the number of points of pressure application to the main slide, the third gives the tonnage exerted by main slide and the fourth indicates the right to left by front to back area of bed. Letter symbols used to designate the various actions have the following meanings: S — Single action, D — Double action, and T — Triple action. A "U" following any of these letters designates that the main drive is located beneath the floor.

To illustrate the numbering system, the following examples are cited:

S1-100-24 x 30—single action, one point suspension, 100 tons capacity with 24 x 30 inch area of bolster.

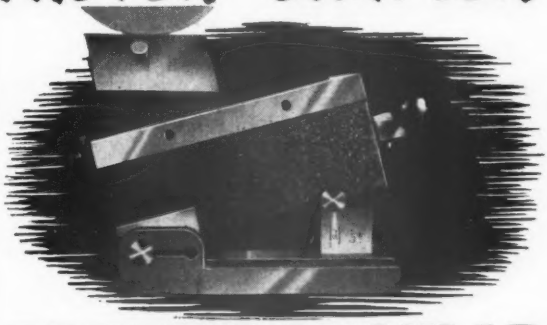
S2-100-48 x 30—single action, two point suspension, 100 tons capacity with 48 x 30 inch area of bolster.

D4-600-1000-144 x 108—double action, four point suspension, 600 ton capacity of blankholder, 1000 ton capacity of main plunger with 144 x 108 inch area of bolster.

TU4-6-10-5-144 x 108 — triple action, underdriver, four point suspension, 600 ton capacity of blankholder, 1000 ton capacity of main plunger, 500 ton capacity of third action slide with 144 x 108 inch area of bolster.

(Continued on page 136)

FASTER-SIMPLER



POSITIVE ANGULAR ACCURACY

the MAGNA-SINE

SEND FOR CATALOG

For any angular set-up, whether single or compound, simply insert standard gauge blocks between the Magna-Sine plates. Proper gauge blocks are indicated in the Robbins Table of Constants. Positive accuracy in a few moments. Work is securely held by magnetic attraction. In two models and sizes; also non-magnetic models for inspection set-ups.

OMER E. Robbins COMPANY

Manufacturers of the MAGNA-SINE and Other Precision Tools

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. . . Leasing, from page 127

Materials Procurement Agency, Atomic Energy Commission, Federal Security Agency, etc.

PECIG is being allocated tools that are stored at two large Air Force storage concentration centers at Marietta, Ga., and Omaha, Neb. The Navy is reporting equipment located at South Charleston, W. Va., Mechanicsburg, Pa., Clearfield, Utah, and Scotia, N. Y. Army depots scattered throughout the country also are letting go of many tools. The Maritime Administration is releasing considerable equipment from three big shipyards on the Pacific Coast and at Wilmington, N. C. GSA tools are coming mostly from places in the East. Equipment also is available under certain circumstances at so-called "package"—or standby—plants that the Government built and equipped for immediate operation in event of a national emergency.

The Government also is relinquishing its machine tools, leased to military contractors, as soon as the contracts run out, thus avoiding idleness of critically-needed equipment longer than necessary.

NPA officials explained that contractors working on so-called "brick-bat" programs—those with the higest military urgency—get the first call on tools registered with PECIG. If at the end of seven days, after the Armed Services are notified of the availability of these critical tools, these items are not picked up for the various "brickbat" programs, they go into PECIG files for screening by contractors performing less urgent work on military and defense-supporting activities.

Many of the 30,000 items of equipment on record at PECIG date back to World War II days. Majority of these tools are in excellent condition. Also included in PECIG files are more modern tools manufactured in recent years — tools that produce closer tolerances and can be operated at higher speeds.

The Air Force recently revised its policy of handling the reporting and allocation of machine tools that are becoming idle as result of the phasing out of aircraft production and engineering design changes. All of these tools are being reported to the Central Inventory Branch for allocation to defense contractors.

NPA has been sending out its own personnel into many contractors' plants to obtain a more accurate picture of production problems in each plant, to render

ARMSTRONG
Carbide
TOOL HOLDERS

FOR HIGHER SPEEDS, AND HEAVIER FEEDS

ARMSTRONG Carbide Tool Holders and ARMIDE (Carbide Tipped) Cutters come in cased sets for tool rooms and maintenance departments, and individually in all sizes for general machine shop and production turning. They permit not only the ready machining of sand-filled castings, the hardest and toughest steels as well as many heretofore "unmachinable" materials, but also make practical much heavier cuts and cutting speeds up to 600 f.p.m. on ordinary work. They also run from 10 to 100 times as long between regrindings.

WRITE FOR CATALOG

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"The Tool Holder People"
5220 W. ARMSTRONG AVENUE, CHICAGO 30, U. S. A.
NEW YORK SAN FRANCISCO

assistance where needed, and to uncover surplus tools. Since NAP's survey teams were activated more than a month ago, approximately 1,500 idle tools have been found. These tools are being reallocated to other urgent military programs. The survey of contractors' plants is a continuing effort.

Cards on file at PECIG list the following information on each available piece of equipment: Standard commodity classification code, type of equipment, size, Government tag number, manufacturer, model number, serial number, owning agency or service, year manufactured, condition, full description, electrical characteristics, acquisition cost, replacement cost at today's prices, estimated repairs, if any; storage location, and whether the tool is special, single purpose or general purpose.

Those wishing to obtain production equipment through PECIG must observe one of two procedures, depending on whether they are military contractors or those engaged in defense-supporting activities.

Military Contractors — They must submit written requests for production equipment to their military contracting officer, or his designated representative. The contracting officer will determine whether or not the request is justified. If it is, he will authorize the acquisition by the contractor of the tools needed. Requests then are forwarded, through designated military channels, to the Central Inventory Branch. There the request will be screened, with the assistance of the service member, against the card records to determine if the desired tools are available. The requesting service is advised and permission is obtained from the owning service for on-site inspection by the contractor, if requested.

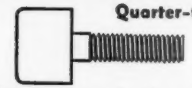
Defense-Supporting Contractors — Requests must be submitted in triplicate to the NPA Industry Division having jurisdiction over the manufacturer's products. Applicants should include complete justification of the need for the equipment. If the sponsoring NPA Division endorses the applicant's request, it will send the approved request to the Metalworking Equipment Division for concurrence and forwarding to PECIG. These requests will be approved by NPA only if the equipment is needed to meet current production schedules for defense-supporting activities. On any item for which on-site

(Continued on page 134)

CUT COSTS ON HOLE-CUTTING
WITH
BOREMASTER

Finished holes 1½" to 11¾" diameter to a depth of 8" in one rapid operation on your present equipment
with
THE BOREMASTER
Not just another Trepanning Cutter but a real heavy duty tool. Stock removed in one piece eliminating waste.
TIME SAVINGS + MATERIAL SAVINGS
= COST SAVINGS
For full details write
KARL A. NEISE
381 Fourth Ave., Dept. TP, New York 16, N. Y.

REID TOOLING AIDS

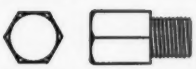


Quarter-turn Screws, assorted sizes.

T-Nuts, case-hardened for all standard T-slots.

Coupling Nuts, case-hardened.

Studs — also T-slot bolts.



Jig feet or rest buttons — hexagon and circular.

Also hand wheels, machine handles, levers, cranks, fixture units, magnetic parallels, machine vises, cast iron knobs. Write for catalog and prices on complete REID line.

REID TOOL SUPPLY CO.
709 Baker St., Muskegon Heights, Michigan

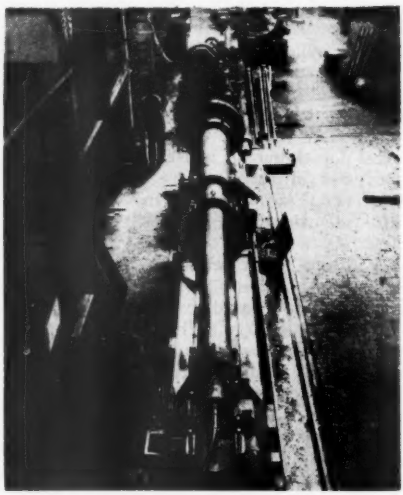
. . . Carbide Tooling, from page 121

true hole.

Cutting a path about 1¼ inches wide, the carbide tool's three work edges divide the chip into three sections, which in turn are curled and broken up by the parallel chipbreakers for easy disposal.

Coolant on all the above operations is pumped in through inside of the trepanning bar and around the core at approximately 110 pounds per square inch of pressure. Chips then flow out with coolant between the outside diameter of the bar and the inside diameter of the bore.

Fig. 6. Typical trepanning operation on steel roll 21½" dia. x 12 ft. long being bored to 15¼" ID on converted Niles boring lathe. Coolant is pumped in through inside of trepanning bar and around core. Chips flow out with coolant between the OD of bar and the ID of bore.



Swiss Machine Tool Importers Merge

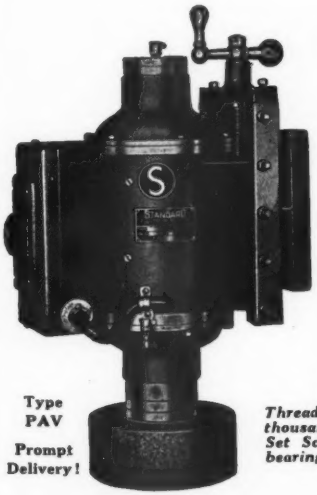
Carl Hirschmann Company, Manhasset, N. Y., long known as offering the widest selection of Swiss precision machine tools in the United States has further established the validity of its recognition in this regard by the complete absorption of Hauser Machine Tool Corporation.

Both companies have been leaders in establishing for American purchasers of imported precision tools, a guaranteed service comparable to that available on tools of American manufacture.

CUTS COSTS!

VERTICAL SPINDLE GRINDER

MAKE YOUR MACHINES "DOUBLE PURPOSE" MACHINES!

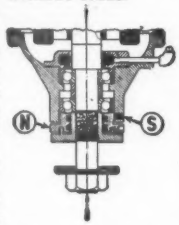


Type PAV

Prompt Delivery!

The Standard Vertical Spindle Grinder is made in sizes from ½ H.P. to 25 H.P. Speeds of 1200, 1800 or 3600 R.P.M. for cup or plate mounted cylinder type of wheel. **Ideal for application to Planers, Boring Mills, Shapers, Milling Machines, etc.** With or without feeds.

This sectional view illustrates a creation of Standard's engineers — evidence that you receive more when you buy a Standard tool. Sectional view of thrust bearing construction on all Standard modern Vertical Spindle and Double End Disc Grinders.



Threaded Nut "N" permits fractional thousandths adjustment by releasing Set Screw "S" to take up wear on bearings without removing wheel—no shims involved.

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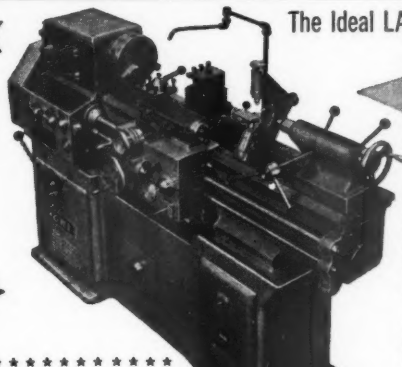
The Standard Electrical Tool Co. Mt. Hope & Sixth St., Cincinnati 4, O.

The Ideal LATHE for Toolroom or Production



Agri

RUGGED!
DEPENDABLE!
VERSATILE!

	Model STARLET	Model STELLAR
Swing	12½"	14"
Distance between centers	20" or 30"	40" or 50"
Spindle speeds	18	18
Speed range	40-1800 rpm	40-1800 rpm
Weight	2094 lbs.	3465 lbs.
Motor	3 hp	4 hp

IMMEDIATE DELIVERY • NO PRIORITIES!

Built with truly rugged construction, this machine fills all the requirements of a heavy, dependable lathe. The headstock has a heavily ribbed and crossbraced body, and special chrome nickel steel is used throughout at strategic points . . . features that add to the rigidity and top quality of the AGRI.

The multi-Vee belt (TEXROPE) transmission is specially designed to ensure high production rate—particularly at low speeds—and all moving parts run on ball bearings and in an oil bath.

Combining the 9 speeds of the gear box with the spindle-gear reduction gives a wide range of 18 speeds . . . covering practically every requirement.

• For further information and illustrated brochure, write today.

MOREY

MOREY MACHINERY CO., Inc.
Manufacturers • Merchants • Distributors
416 BROOME ST. • NEW YORK 13, N. Y.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

. . . Leasing, from page 131

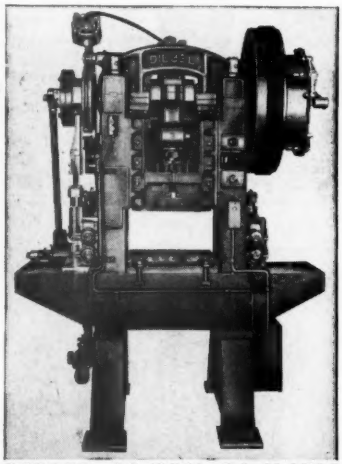
inspection has been authorized, PECIG will hold the inventory card in a suspense file for 15 days. The applicant must accept or reject the item within that period. If applicant accepts the tool, PECIG will immediately issue shipping instructions to the owning agency. Arrangements then will be made by PECIG for the applicant to enter into lease terms.

PECIG officials emphasize it is advisable and time-saving for the contractor to "hand-carry" his request through the foregoing channels to the Central Inventory Branch, and participate in screening for the equipment he wishes. PECIG does not maintain, nor distribute, lists of available equipment to contracting officers or to contractors. Tools are obtained through PECIG under either one of two kinds of leasing arrangements. In the case of equipment owned by the military services, the strictly military contractor can lease the items at one percent a month of the original acquisition cost. If the leasing arrangement is made with GSA, the terms are one percent a month, based on the OPS (Office of Price Stabilization) prices.

The machine tool inventory center is located in Room 334 of the Old Postoffice Building, Twelfth and Pennsylvania Avenues, Washington, D. C.

modern press engineering +
correct die design =

HI-STAMPING PRODUCTION



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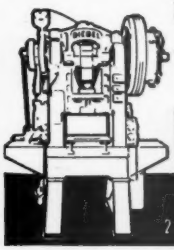
• Positive action air clutch and brake — accurate stampings up to 360 per minute.

• Four main bearing crankshaft frame provides greater rigidity, smoother operation, longer life.

• Cylindrically shaped slide — over 380 square inches of guiding surface assures longer press and die life, less down time.

• Air clamped roll feeds driven by overrunning double ball bearing precision clutch — variable feeds up to 11 inches — easy to set and adjust.

• Built-in shock absorbers, minimize vibration, noise and shock to die, press and floor—thus eliminating costly maintenance and repairs.



These outstanding features, plus twelve others, add up to greater profits for you!

DIEBEL HI-PRODUCTION AUTOMATIC PRESSES

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Di Machine Corp.

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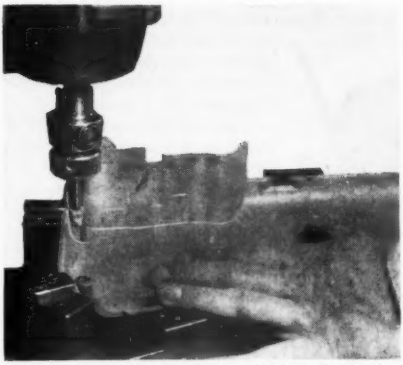
Wire Inserts Form Strong Threads in Magnesium

In converting the side covers of their calculating machine from aluminum to magnesium castings, the engineers of Marchant Caculating Machine Company, reduced the weight of their machine. But to accomplish this change they had to offset a limiting physical characteristic of the magnesium, that is, it slow tapped thread strength.

Required strength in the metal was obtained by installing stainless steel thread inserts into the prepared thread bosses of the cast side covers. Three inserts are



Photos courtesy Heli-Coil Corporation.

Fig. 1. Boss on right side cover being tapped to receive a thread insert. Holes for inserts are drilled and tapped according to specifications and taps supplied by insert manufacturer. Standard drill sizes are used and thread fits from class 1 to 3 can be produced.

used in each cover, forming 5/16-18 internal threads 5/16 in. deep

The inserts, helical coils of diamond-shaped stainless steel wire, serve three purposes. First, they provide internal threads having a tensile strength up to 50 percent greater than is possible in the magnesium alone. This added strength permits the calculator to be lifted and carried from place to place without danger of stripping the threads in the castings and pulling side covers from the machine. Second, the tight-fitting stainless steel inserts prevent the electrolytic action that would result in corrosion if standard steel threaded fasteners came in direct

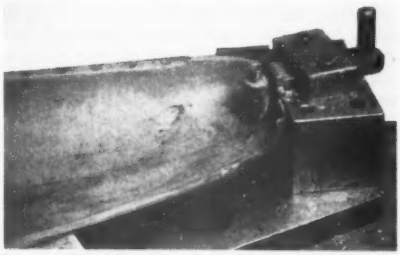


Fig. 2. Thread insert of stainless steel diamond shaped wire partially installed. Because the free diameter of the coil is slightly larger than its installed diameter, a close fit is assured between the insert and the tapped thread, which prevents the insert from inadvertently backing out of the hole during removal of the screw.

contact with the magnesium. Third, should the side plates ever need to be removed for servicing the inner parts of the machine, there is no risk of damage to the protected tapped threads, since the inserts are harder and tougher than any machine screw.

No increase in assembly time was reported as a result of using the thread inserts. This may result from the fact that the inserts prevent possible stripping and cross threading in soft metal parts during assembly. The Marchant Calculating Machine Company is using magnesium side covers fitted with thread inserts for all models now in production, including their eight- and ten-bank machines.

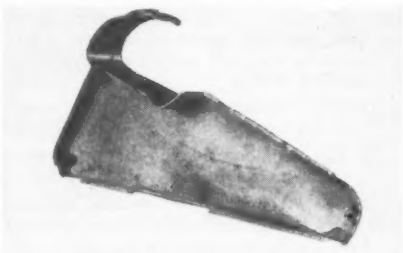


Fig. 3. Right side cover with three thread inserts installed. Notice that the tapped hole into which the inserts have been turned are not much larger than the ID of the insert. No increase in boss size is required. Thread strength is increased to a point where the screw will fail before the threads will strip.

. . . Press Standardization, from page 129

Bolster Plates

Bolster plates made from cast iron or SAE 1020 steel are located centrally on top of bed by the addition of two dowels, one located at the front right hand side and the other at the back left hand side. Dowel pin centers have a given fixed dimension for each of the various widths and depths of bolsters and must be held to within tolerances of plus or minus .015 of an inch, measured from center lines of bolster.

The top flange of bed is to have a removable means for holding dowels in place and provisions are to be made for removing dowels from the under side of flange.

Bolster bolt pockets have machined surfaces and are located right to left on given center dimensions. All medium and large tonnage presses, other than the rail presses, use 1¼ inch diameter bolts with a fixed dimensional head forged integral with the body. Bolts are made from a fine grain steel, oil quenched and with a minimum ultimate strength of 130,000 P.S.I. Six lengths have been standardized; the shorter sizes to be used on the medium tonnage presses and the longer sizes on the larger tonnage presses.

Bolster plates are provided with horizontally tapped holes in the four corners, in both directions, to enable the mounting of handling hooks. These holes vary in diameter according to size and weight of bolsters.

Bolster pressure pin holes having 1⅛ diameter with a 6-inch spacing pattern are drilled through the bolster and have a ¼-inch x 45° counter sink in the top of each hole. Special plugs with tapered heads may be inserted in the holes not being used to prevent dirt and all foreign matter from dropping through to top side of pressure pad. A series of numbers and letters are stamped on the center lines to aid the die setter in identifying each hole.

T-slots have been specified to replace the common practice of using tapped holes of no common pattern in the top of bolster for holding lower dies in a press. By having a common pattern and size of T-slots, dies on the multiple point presses can readily be interchanged from a smaller to a larger tonnage machine. T-slots are machined from front to back of bolster to receive a 1-inch bolt. The two center slots are spaced 3 inches on either side of center

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WHENEVER shop prints specify microinch roughness, the Profilometer is the most practical means of checking the parts against those specifications. HERE'S WHY:

1 The Profilometer shows surface roughness *directly in microinches r.m.s.*, on an easy-to-read meter.

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Profilometer is a registered trade name.

MICROMETRICAL MANUFACTURING CO.
FORMERLY PHYSICISTS RESEARCH COMPANY
345 S. MAIN ST. ANN ARBOR 15, MICHIGAN

line. Slots continue at spacings of 6-inch centers on both sides of these two slots.

The single point presses including the straight side and gap frame presses, use a somewhat similar pattern but with slots machined a fixed distance toward center from all four sides.

Slides

The slide and bed of a given size single action, multiple point press have the same areas both right and left and front to back, and the same applies to the bed and blankholder of double and triple action presses.

Location and size of T-slots in the main slide are the same as the bolster on the multiple point, single, double and triple action machines.

The number and location of knockout holes in slides have not been determined in the standardization. The user is required to specify knockout requirements at the time of inquiry of new presses.

On all presses, other than those having gap frames, the slide ways are to be contained in the gibs at all times at both ends of stroke and adjustment.

Draw Cushions

Removable hardened steel wear plates, to support pressure pins, are to be mounted on top of pressure plate.

Pressure plate must be positively stopped when top of wear plates, in up position, is ½-inch below bottom of bolster.

No specific tonnage has been set up for cushions but a general understanding exists that cushions having approximately 1/6 of the pressure exerted by main slide is suitable for most classes of draw work.

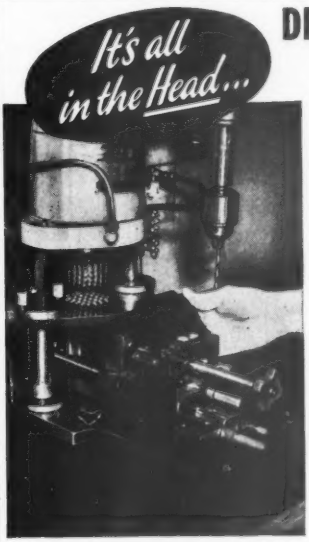
Press Data Plates

The specification plates are to be mounted on left hand upright, showing serial number, tonnage, stroke, shutheight, adjustment, size of bolster left to right and front to back, strokes per minute, and in the case of double or triple action presses, the depth of effective draws.

Cushion Data Plates

The specification plate is to be mounted directly beneath press data plate showing number of cushions, number of bed openings, cushion pressure at 10 lbs. per square inch of air, cushion travel, cylinder diameters, and diagram showing sizes of openings in bed.

All meetings are held as open forums and the desire of both the users and suppliers groups is to standardize the die mounting dimensions of presses.



DRILLING HOLES AT IBM

• No time lost drilling millions of holes in business machine parts. IBM cashes in on the many features of Zagar Gearless Drillheads: many holes drilled at one pass; any number of holes in any material in any pattern as close as twice drill diameter; accurate spacing maintained. Standard Zagar Gearless Drillheads can be adapted readily to your needs. Send us your parts drawings.

◄ 110 holes on 3/8" centers are drilled in the inserts of molded phenolic block. 20 drills in head; 6 feeds to complete each block.

Get Engineering Manual T-11 for more information on all Zagar's tools for industry.

★ ★

ZAGAR TOOL, INC.
24000 LAKELAND BLVD.
CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

Illustrated Cutting Tool wall chart is available from Severance Tool Industries, Inc., 730 Iowa St., Saginaw, Mich. It illustrates cutting tools representative of the Severance line, measures 14" x 14", is tinned top and bottom, and has hanger ready for posting in the shop or office.
Circle Inform-A-Gram No. B1.

"Pressure Applied To Staking Cuts Assembly Rejects" This is the title of a paper by a G. E. methods engineer now available from the Denison En'g Co., Columbus 16, Ohio. The paper has details of cutting costs by successful application of hydraulic and air staking presses.
Circle Inform-A-Gram No. B2.

USE RESISTANCE WELDING TO STREAMLINE PRODUCTION

WS

WF

Ohio Nuts for Projection Welding

WS Thread Sizes	WF Thread Sizes
6-32 to ½-20	6-32 to ¼-28

For samples and information about Ohio Nuts for projection welding, send to

THE OHIO NUT & BOLT COMPANY
33 First Avenue., Berea, Ohio

South Bend 10" Precision Toolroom Lathe has 1" collet capacity and 1⅜" spindle bore. Other specifications include 10⅛" swing over bed and saddle wings, 12 spindle speeds between 50 and 1375 rpm., thread cutting 48 R.H. or L.H. pitches, 4 to 224 per inch. Precision lead screw, thread dial indicator, and thread cutting stop are fitted as standard.
Circle Inform-A-Gram No. B3.

Dake Guided Platen Presses are available in capacities to 300 tons. Dake Engine Co., 634 7th St., Grand Haven, Mich., specializes in press development to meet your requirements. Literature available.
Circle Inform-A-Gram No. B4.

Burs, Reamers, End Mills, Boring Bits, and tools by the Atrax Co., Francis Ave. & Day St., Newington 11, Conn. are made in tungsten-carbide precision ground from the solid. Complete colorful catalog now available.
Circle Inform-A-Gram No. B5.

RB Punches and Die Buttons have special locking device for instant insertion with accurate alignment, save time in die design, construction, and operation. They are standard, quickly mounted without machining, and cut press down time. 52 page R-B catalog from Allied Products Corp. has full specifications and details.
Circle Inform-A-Gram No. B6.

Buck 6 Jaw 6" Chuck boasts precision to .0005". One pinion moves jaws, while chuck is equally adaptable to lathes, screw machines, dividing heads, grinders, etc. Current catalog from Buck Tool Co., 618 Schippers Lane, Kalamazoo, Mich., has details of this and remainder of line.
Circle Inform-A-Gram No. B7.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

Many Unusual Examples of Manufacturing Processes and Equipment in its metal stamping and die making plants are described in a new brochure from the City Auto Stamping Co., Toledo, Ohio. These two plants combine in the engineering and production of major components for automotive, agricultural, and consumer-type industries. Their combined facilities include exceedingly modern equipment and production techniques, and command some of the largest capacity machinery in the country. More than ninety presses are used in the stamping plant, ranging in size from portable machines to 1200 ton capacity presses having operational bed areas measuring 100 x 180 inches.
Circle Inform-A-Gram No. B8.

Current Bulletin of Air Tools from Mall Tool Co., details and prices the complete company line of light-weight, high-performance and compact hand tools.
Circle Inform-A-Gram No. B9.

New Gage Catalog C from Standard Gage Co., Inc., gives details of "Dializer" attachment for converting any AGD adjustable limit snap gage to an indicating dial snap gage.
Circle Inform-A-Gram No. B10.

Transfer Screw Set by Heimann is fast and precise way of transferring open and blind screw holes. Maker is now mailing literature on this self-contained complete tool.
Circle Inform-A-Gram No. B11.

Vertical Spindle Grinder by Standard Electrical Tool Co. is made in sizes from ½ to 25 HP, is designed for shaper, boring mill, milling machine application. Catalog 44 gives full data on such features as fractional thousandths bearing adjustment method.
Circle Inform-A-Gram No. B12.

Production Facilities for contract work at Barth Stamping & Machine Works, Inc., have just been increased by the addition of an electronically-governed grinder with a capacity for work up to 10" diameter and 48" long. Current catalog gives details of contract tool, die, special machinery, and production work now undertaken.
Circle Inform-A-Gram No. B13.

Stress-Relieved Notch-Coil retainer rings retain close tolerance at all times, permit mass production and brazing without, hold-ups. Information on these rings is available by writing the Lucas-Milhaupt Engineering Co., 5059 So. Lake Drive, Cudahy, Wis. Manufactured and delivered in any wire thickness, diameter in butt, lap, and gap form.
Circle Inform-A-Gram No. B14.

PICK THE BEST TOOL FOR GRINDING WORK...

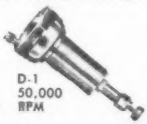
Onsrud PORTABLE AIR TURBINE GRINDERS

There are endless uses in your plant, machine shop, or tool and die room, for lightweight, high speed Onsrud Air Turbine Grinders. Remove burrs and fins from castings; perform exacting internal grinding operations.

Precision built to hold RPM under load. Cool running. No commutator segments or brushes to wear out. Operates in any position. Uses small grinding wheels, rotary files, or new carbide burrs.

WRITE FOR GRINDER BULLETIN 1129

B-1 75,000 RPM


D-1 50,000 RPM

E-1-A 38,000 RPM

ONSRUD MACHINE WORKS, INC.

3941 PALMER STREET • CHICAGO 47, ILLINOIS

"DBL-2" High Speed Steel has high edge strength and excellent cutting qualities. Write Allegheny-Ludlum Steel Corporation, Henry W. Oliver Bldg., Dept. TD-32 for copy of the brochure "Cutting Tool Materials," with full information on this and the other company products.
Circle Inform-A-Gram No. B15.

Multiple and Single Point Tool Bits with round or serrated shank are described in latest catalog from Apex Tool & Cutter Co. End mills, combination boring and facing mills, and alternate angle cutters are featured.
Circle Inform-A-Gram No. B16.

Complete Tool Grinder Range from the Ex-Cell-O Corporation is featured in Bulletin 46262. All machines are equipper for face grinding on cup type wheels, are double-ended, and have large tool-rest tables. Write to the company at 1200 Oakman Blvd., Detroit 32, Mich., for your copy.
Circle Inform-A-Gram No. B17.

Complete Line of End Mills and Holders is featured in latest 90-page catalog No. 10 from Weldon Tool Co., Cleveland 4, Ohio. All relevant information is included in this well-laid-out, easy-to-read publication.
Circle Inform-A-Gram No. B18.

Triple-Chip deters welding and pick-up; prevents rust. Consequently, tool life is lengthened and accurate, milled-finish work is produced. Tool maintenance and replacement is reduced. Furthermore, Triple-Chip is non-injurious to the skin, is smokeless and odorless.

Get a supply today from your local dealer.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING CLEVELAND 13, OHIO
COMMAND OUR UNPARALLELED EXPERIENCE IN CIRCULAR SAWING . . .

Die Steel Cutters are subject of new catalog 150 from the Tomkins-Johnson Co., 617 N. Mechanic St., Jackson Mich. Complete range is described, all necessary information given.
Circle Inform-A-Gram No. B19.

New Folder TP-8 from Jergens Tool Specialty Co., details the company line of mass produced fixture parts, also has information on chuck jaw blanks, strap clamp assemblies, and a cast aluminum line of hand wheels, levers, and knobs. Over 375 fixture parts are kept in stock for immediate delivery.
Circle Inform-A-Gram No. B20.

Aid to Drill Jig Design is given by current catalog from Colonial Bushing Inc., which you may now send for.
Circle Inform-A-Gram No. B21.

Century "1000" Manually Propelled Hydraulic Lift is designed for light and medium materials handling needs. A new brochure has been issued detailing applications and economies of this low cost 1000-pound lift, describing construction features and hydraulic pump operation, and giving specifications on materials and design. Dept KP, Century Products Co., 5925 Highway 7, Minneapolis 16, Minn.
Circle Inform-A-Gram No. B22.

Jig Boring and Cam Milling Service is offered by the Eisler Engineering Co., together with special contract production, development, and experimental work. Full details available.
Circle Inform-A-Gram No. B23.

Yost Drill Press Vise is specially made for drill operations, is made in two sizes. Current brochure features this vise, also has remainder of the Yost Mfg Co.'s line.
Circle Inform-A-Gram No. B24.

The Bliss Deferred Payment Plan is subject of new folder from the E. W. Bliss Co., Canton, Ohio. Complete details are given including monthly payments and interest charges. Twelve to thirty-six months, 25% down payment.
Circle Inform-A-Gram No. B25.

"Air Saver" Air Valves recently developed by the Palmer-Shile Co., 16039 Fullerton Ave., Detroit 27, Mich., give leak-proof air power control during every split-second phase of machine operation. Applications to boost efficiency at punch press, die casting machine, drill press, broach, etc., are described in literature now available from maker.
Circle Inform-A-Gram No. B26.

Bokum Boring Tools are now available either in high speed steel, carbide tipped, or solid carbide styles. Work sizes from 1/16" ID. Complete listing may now be had.
Circle Inform-A-Gram No. B27.

New Arbor Bulletin from the Kempsmith Machine Co., Milwaukee, 14, Wis., describes the complete line of arbors and accessories, also has helpful information on how to keep your arbors in the best condition. Product is available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle.
Circle Inform-A-Gram No. B28.

Johnson Metal Cut-Off Band Saws are efficient and low-cost, have ample capacity and ruggedness. Literature describing the complete line is available from the Johnson Mfg. Corp., Albion, Mich. Machines are available either as wet or dry cutting.
Circle Inform-A-Gram No. B29.

Sheldon 12" Back-Geared Shaper is described in new catalog from the Sheldon Machine Co., Inc., 4235 N. Knox Ave., Chicago 41, Ill. Big machine performance, small machine price.
Circle Inform-A-Gram No. B30.

Portable High Frequency Induction Heating Unit is described in catalog TD-8, latest literature from Lepel High Frequency Laboratories, Inc., 55th Str. and 37th Ave., Woodside 77, New York City, N. Y. The machine may conveniently be operated on bench or table without a mounting and is ideal for hardening, brazing, and soldering either ferrous or non-ferrous metals.
Circle Inform-A-Gram No. B31.

Short Run Horning or flange notching problems are solved through the use of Leslie model "A" hand punch press. Notching operations can be done on large parts after the forming operation. Full data and specifications from Leslie Welding Co., 2937 Carroll Ave., Chicago 12, Ill.
Circle Inform-A-Gram No. B32.

Ex-Cell-O Hydraulic Power Units give compact, flexible automatic drilling, reaming, power source for cutting tools, are especially suitable for and counterboring. Three available styles are described in bulletin 45361 from Ex-Cell-O Corp.
Circle Inform-A-Gram No. B33.

Complete Specifications on the Cincinnati "Filmatic" No. 2 centerless grinding machine may be obtained by writing for catalog No. G-591. If you have'nt considered automatic centerless grinding for your precision parts, bring yourself up to date by writing for your copy now.
Circle Inform-A-Gram No. B34.

Erickson Mandrels grip along their entire length, giving positive grip and self release, each accommodating a wide range of sleeves. Catalog "J" from Erickson Tools Div. has details of these and other company products.
Circle Inform-A-Gram No. B35.

The New Super-Hard Carbide Drill
Up to 200% Greater Life
A Better Drill For Hardened Steel
Long carbide end keeps cutting heat away from braze.
Write for Catalog Supplement No. 4
Super
QUALITY CARBIDE TOOLS
21650 Hoover Rd., Detroit 13 • 5210 San Fernando Rd., Glendale 3

Holding Fixtures of all types are designed and built by Swartz Tool Products Co., Inc. There are 75 models and fixture sizes from which to choose. Catalog 941 contains all data.
Circle Inform-A-Gram No. B36.

Balas Collets are Specially Inspected, machined to exact tolerances from selected steels, and properly heat treated to give maximum accuracy and life. They feature cam-grinding on the taper to a special "cloverleaf" shape for faster opening and closing, to prevent "sticking" of the chuck and to reduce chatter. Balas Collet Mfg. Co., 1563 E. 27th St. Cleveland 14, Ohio.
Circle Inform-A-Gram No. B37.

Bulletin 1020A from Rivett Lathe & Grinder, Inc., contains full data on the Rivett 1020S lathe. This is a double-duty machines, combining the precision and sensitivity of an instrument lathe with the heavy-biting ruggedness required for carbide tooling. First-rate progressive design and sound engineering also go hand-in-hand.
Circle Inform-A-Gram No. B38.

Foster Precision Vernier Calipers are made in a size range from 8" to 40" for immediate delivery. Features include micrometer screw adjustment, 1/128" and 1/1000" verniers, and tempered jaws and scribing points. Foster Supplies Co.
Circle Inform-A-Gram No. B39.

Your Entire Stock of Drills...
Seen at a glance
HUOT DRILL DISPENSER
for
• TOOL CRIBS • STOCK ROOMS • MACHINE SHOPS
Saves Time hunting through stacks of packaged drills. Compartments hold a gross of small sizes—a dozen or more of the larger ones. Raised letters on easy sliding drawers . . . hammerlin gray baked enamel finish . . . 14½"x7¼"x7¼".
Write for Circular
Model No. 1: Fractional drills 1/16" to 1/2"
Model No. 2: Number drills 1 to 60
Model No. 3: Letter drills A to Z
HUOT MFG. CO.
581 NORTH WHEELER
ST. PAUL 5, MINNESOTA
Huot is pronounced "Hew-ot"

Graphitic Tool Steel from the Timken Roller Bearing Co., Steel and Tube Division, Canton 6, Ohio, is featured in new 10th edition of "Timken Graphitic Steel Data Book." "Graph-Mo," one of the four grades, excells for die use, has outstanding anti-friction qualities, with minimum tendency to scuff, seize, score or gall. It also is easier to machine than the ordinary tool steels.
Circle Inform-A-Gram No. B40.

Complete Listing of Drill Jig Bushings is given in latest literature from the Universal Engineering Co., Frankenmuth, 8, Mich. Maximum efficiency and long life result from careful machining of fine steel, superhoned bores, and rigorous inspection between manufacturing stages.
Circle Inform-A-Gram No. B41.

Hydraulic and other Fluid-Handling Applications where the efficiency and economy of aluminum tubed systems can be used to advantage are described and illustrated in bulletin 4316B2 of the Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio. The bulletin also pictures the twelve Parker aluminum "Triple-Lok" tube fitting shapes now available from standard stock.
Circle Inform-A-Gram No. B42.

Featherweight Air Grinders are described in colorful 20 page catalog 3006 from the Madison-Kipp Corp. Also covered are accessories including mounted grinding wheels, cutters, tool post adaptors, etc.
Circle Inform-A-Gram No. B43.

Toolbit Collets by DoALL have built-in accurate adjustment for the bit without the necessity of loosening the collet in the holder or the boring bar. Bulletin 51-828 from the DoALL Co., Des Plaines, Ill. gives full details of the collet, showing typical installations in flycutters, combination boring, facing, and turning tools, and multiple boring bars. Complete ordering information is given on the last page.
Circle Inform-A-Gram No. B44.

Hydraulic Cylinder Bulletin H-104G from the Miller Motor Co., 2040 N. Hawthorne Ave., Melrose Park, Ill., supercedes previous issues, gives complete and compact engineering, design, construction, mounting and dimension data covering the line of space-saving square-design hydraulic cylinders for 2000 - 3000 psi operation. 13 different mounting styles in 1½" through 12" bores are described. Layout makes reference very easy.
Circle Inform-A-Gram No. B45.

Comprehensive Catalog of end mills with special attention to sizes from .1875 down is available from the Woodson Tool Co. Mills feature polished flutes for fast cutting, long life, strength.
Circle Inform-A-Gram No. B46.

Miti-Mite No. 250 is featured in bulletin 604 from Enco Mfg. Co., Dept. 782, 4524 W. Fullerton Ave., Chicago 39, Ill. This is addition to well-known Enco line of magnetic equipment, eliminates clamping, and throws directed 100 watt light exactly where needed for any operation.
Circle Inform-A-Gram No. B47.

A New Standard Die Catalog has been issued by the Federal Machinery Company, 134 Grand Street, New York 12, N. Y. It is designed for quick reference, and is most helpful to any sheet metal fabricating shop. The catalog describes standard punches and dies for all presses, and contains detailed diagrams, charts, and tables. Punch and die adapters and die shoes are also discussed. Each item is priced. Write to the Sales Department of the Federal Machinery Company for your copy.
Circle Inform-A-Gram No. B48.

Superior All-Steel Die Sets and Supplies are detailed in current catalog from Superior Steel Products Co., 2754 S. 19th St., Milwaukee, Wis. Wide range of special and die set models are in stock.
Circle Inform-A-Gram No. B49.

Die Making Machinery designed for speed in lapping, sawing, and filing operations is described in current literature from the Oliver Instrument Co., 1436 E. Maumee, Adrian, Mich. Full data is given.
Circle Inform-A-Gram No. B50.

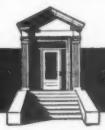
High Precision "ABA" Surface Grinder handles the heaviest and most difficult jobs, has complete hydraulic table feed as well as hand feed. All hand wheels and operating levers ball bearing mounted for easy operation. Grinding area max. 24" x 8", table speed infinitely variable to 55 fpm. Full details from Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y.
Circle Inform-A-Gram No. B51.

Precision Grinder-Miller Attachment amplifies the production potentialities of your machinery, cuts floor time between operations, allowing multiple operations in one setup. Attachment has ample capacity for making best use of carbide cutters. Precision Products Co., 1341 Clark St., Racine, Wis.
Circle Inform-A-Gram No. B52.

All 60° Standard and Special Threads are quickly checked between pitch ranges of 4 to 56 with new thread triangles. Calculation by adding a constant to OD. Bulletin from Montgomery & Co., Inc., 53-T Park Place, New York 7, N. Y.
Circle Inform-A-Gram No. B53.

ANOTHER GRINDING ROOM PROBLEM SOLVED!

The small, precision-built machine you see above is the Radi-Form, a grinder attachment, that does almost everything but talk. The Radi-Form can move the work in a predetermined arc of any desired radius, from 1/15" to 2" concave, from .00 to 2" convex, which means that radii can now be generated even on carbide tipped cutting tools in a matter of minutes, to within .0005 accuracy on a standard, unformed, cupped diamond wheel. You save headaches, time, and gain increased production. Write for literature and prices that will surprise you.



W. F. MEYERS CO., INC., BEDFORD, INDIANA

High-Speed Heat-Treat Furnaces in two models offering wide temperature ranges for any steels, dies, tools, etc. Firebox 7" x 13" x 16½", complete with Carbofrax hearth, G. E. motor, and Johnson blower. Current catalog from Johnson Gas Appliance Co., gives details of these and other models.
Circle Inform-A-Gram No. B56.

Solid and Carbide Tipped circular cutters by Meyco are made to suit your requirements for best performance over the longest valuable production life. You can now get complete information from the W. F. Meyers Co., Inc., Bedford.
Circle Inform-A-Gram No. B57.

Type "S" Straight Wheel Tool Grinder has two spindle speeds, maintains correct peripheral speed throughout wheel life. Tilting table adjusts to wheel wear, while safety interlock prevents overspeeding of wheel.
Circle Inform-A-Gram No. B58.

L & J Presses are precision engineered for dependable service with minimum maintenance. Made in 12 O.B.I. models, back geared and plain fllywheel types, in 8 sizes from 6 to 80 ton capacities. Literature is available with full data from the L. & . Press Corporation, 1626 Sterling Ave., Elkhart, Ind.
Circle Inform-A-Gram No. B59.

Drill Hardened Steels without Annealing—

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—
With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

Also makers of—
BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS
Write for information

A New Electro-Mechanical Punch Press Stop has just been announced by the Brinnel Co., Simsbury, Conn. This "Prestop" electrically holds down the treadle or hand lever of the press, releasing it instantly when the single stop button is pressed. In the event of power failure a solenoid is de-energized and the press stops automatically. The clutch must be engaged manually before the press can be restarted. The device is universally adaptable to punch presses with mechanical clutches. Bulletin is available from maker.
Circle Inform-A-Gram No. B60.

Webber Gage Blocks are now made in a new carbide which has the same expansion coefficient as steel. Great resistance to corrosion as well as accepted carbide hardness and wear resistance are also features. New brochure is now available from Webber Gage Co., 12903 Triskett Rd., Cleveland 11.
Circle Inform-A-Gram No. B61.

Wells Metal Cutting Band Saws have modest first cost throughout the size and capacity range, yet give consistently accurate work on a production basis. Bulletin is now ready for distribution.
Circle Inform-A-Gram No. B62.

Grobet Chatterless countersinks have six staggered cutting edges for clean cutting without chatter. Detailed catalog AC1 from the Grobet File Co. of America, Inc., contains full data.
Circle Inform-A-Gram No. B63.

New 2000 and 2200 Series Frauenthal Double Head Heavy-Duty Precision Grinding Machines are described in literature from A. Harold Frauenthal Inc., 930 W. Sherman Blvd., Muskegon, Mich. These grinders have table measurements up to 140". Due to rugged construction, diameters and parallelism of faces have been ground to tolerances of .0002". Tabular specifications and interesting production applications are given.
Circle Inform-A-Gram No. B64.

Federal Presses in range from 6 to 80 tons are described in brochure from the Federal Press Co., 507 Division St., Elkhart, Ind. These presses have special clutch with electro-pneumatic control, have no mechanical linkage to break down. May be "inched", single-tripped, or operated continuously.
Circle Inform-A-Gram No. B65.

Landis 14" and 18" Type C Universal Precision Grinders. A new and attractive catalog describes the possible adaptations of these machines, with the aid of thirty-four illustrations and specifications. Type C Universals combine many outstanding engineering features with the solidity an dependability needed in production grinding, yet set-ups may be made so quickly that they are valuable equally in the toolroom. Write the Landis Tool Company, Waynesboro, Pennsylvania, for your copy.
Circle Inform-A-Gram No. B66.

Heinrich Handy Drill Press Vise automatically squares squares work, built in V groove permits precision side and end drilling of round stock, since jaws are precision ground at right angles to parallels. Literature now available from National Machine Tool Co., Dept. 132-D, Racine, Wis.
Circle Inform-A-Gram No. B67.

Versatile Benchmaster Mills provided with two new accessories. Special splash tray captures coolant run-off, and a pedestal base furnishes a solid, secure, floor mounting. This low cost machine will do both vertical and horizontal milling, drilling, grinding and turning with simple accessories. Descriptive literature available.
Circle Inform-A-Gram No. B68.

The Walls Manual on Finishing contains descriptions of the company's ½ hp Simplex M abrasive band grinder, also other styles and sizes. Improved band tension device is fitted.
Circle Inform-A-Gram No. B69.

Clamp Assemblies, Components, and Fixtures are detailed in latest catalog from the West Point Mfg. Co., 26935 W. 7 Mile Rd., Detroit 19, Mich. Clamps are in heat treated alloy steel specially rust-proofed, and are available from stock in 15 types and 100 standard sizes. Full scale template drawings sent on request.
Circle Inform-A-Gram No. B70.

Self-Powered circuit continuity tester by Ideal Industries, Inc., needs no live-wire connections to operate. Literature now available gives details of this one-handed convenient device.
Circle Inform-A-Gram No. B71.

Nichols Tool-Room Miller Combines Accuracy, Flexibility, and Low Price. It is arranged for sensitive hand screw feed has table surface of 8½" x 30", with rise and fall spindle for easy handling of difficult operations. Literature with full specifications and accessories from the W. H. Nichols Co., Dept. J-3, Waltham, Mass.
Circle Inform-A-Gram No. B72.

Model MG Surface Grinder from Sanford Mfg. Corp., 1024 Commerce Ave., Union, N. J., is described in new catalog. Specifications include 8¾" transverse, 13" long., 12" vert. under 7" wheel with adaptor.
Circle Inform-A-Gram No. B73.

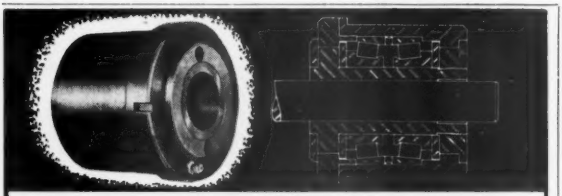
Save Money
ON PRECISION
DIE CUT STAMPINGS
IN SMALL LOTS
FOR EXAMPLE:—
The close tolerance stamping shown above was produced by our exclusive, low-cost WLS Speedtooling Method at a cost of
$62.00 for first 100 pieces.
$9.20 for each additional 100.
Proportionately low prices will apply to die stamped parts that you require — any size or shape up to 5/16" thick. Average die life — up to 100,000 pieces.
OUR SPECIALTY—
Short Run Stampings
WLS Speedtooling
method assures low die cost on small, irregular shaped parts, stamped, formed, pierced, extruded, stencilled, tapped, countersunk.
WRITE OR WIRE FOR NEW
FREE BULLETIN
Illustrates 40 Small Stampings
Send Your Prints
for Quotations
3290 East 80th St.
Cleveland 4, Ohio
WLS STAMPING COMPANY
SMALL LOT STAMPINGS

Dahlstrom Tap Guide hand taps with machine precision, adapts quickly for lathe use. Furnished complete with 9, tap adapters 8/32" to ¾". Current literature describes, also features tap chucks and autostops. Dahlstrom Mfg. Co., 5601 Woodlawn Blvd., Minnesota 17.
Circle Inform-A-Gram No. B74.

Air-Operated Dial Feed Tables are subject of the A. K. Allen Co.'s latest illustrated brochure. Models 11EA and 11EB have completely enclosed drive mechanism, and flame-hardened working parts. Literature on request.
Circle Inform-A-Gram No. B75.

Compression Spring Assortments, trigger stops for progressive dies, gauge handles and stops, magnetic parallels and V blocks, and many fixture components are described and priced in current comprehensive catalog of the Reid Tool Supply Co., 709 Baker St., Muskegon Heights, Mich.
Circle Inform-A-Gram No. B76.

Dumore Tool Post Grinder mounts on planer, lathe, shaper, mill, etc., with equal facility. Internal grinding accurate to .0001" can be performed, transfer and floor time saved, Catalog from Dumore Corp., Racine, Wisconsin.
Circle Inform-A-Gram No. B77.



THE ONLY PILOT BEARING BUSHING WITH ABSOLUTE SEAL AGAINST COOLANT AND GRIT!

True—absolutely true—the Jergens Pilot Bushing provides complete sealing against abrasive grits and dust or other damaging materials entering into the roller bearing cavity. Amazing as it seems the entry of grit into the outer seal actually increases the effectiveness of the seal. Furthermore, this revolutionary bushing provides greater bearing accuracy—bushing stability and the first long lasting, complete seal in the roller bearing field.

SEND FOR CATALOG No. TP-11

PERFORMANCE FEATURES
* Absolute seal against coolants, grit and dust
* Bearings can be dissembled without removing housing
* Cartridge - type bearing holder provides greater accuracy
* Protects against thrust loads as well as radial
* Tapered bearings can be adjusted to compensate for wear
* Adaptable to receive removable slip bushings
* Adaptable to receive keys or keyways
* Can be furnished with shafts to use as pressure rolls

J. G. JERGENS CO.
11106 AVON AVE • CLEVELAND 5, OHIO

Cincinnati 12" and 26" Hydroform is newly developed deep drawing machine offering considerable performance advantages and savings over conventionally designed machines. Fewer Operations, Simple Tooling, Quick Set-Up, and Improved Product Quality are among the capital advantages listed and described in a beautifully illustrated and prepared brochure from the Cincinnati Milling Machine Co., Cincinnati 9, Ohio, which is now available to readers. Publication No. M-1759.
Circle Inform-A-Gram No. B78.

New Flute Development of the Eclipse counterbore allows deep operations with a wider range of pilot sizes, gives faster chip removal for cool cutting. This improved design, together with a full range of standard cutters, are graphically featured in the latest catalog from the Eclipse Counterbore Co., 1600 Bonner Ave., Detroit 20, Mich.
Circle Inform-A-Gram No. B79.

Producto "Surefeed" can be quickly mounted on the die set for automatic feeding. Set up and adjustment are very simple, while a high degree of accuracy is obtained through direct mechanical linkage and positive action. No press alterations or adjustments are required; stock capacity up to 2" wide and .045" thick.
Circle Inform-A-Gram No. B80.

52-Page Book of drawings, specifications, and prices on the Noble & Stanton line of standard jig and fixture parts is now available. If you can use, will save two-thirds the cost of tool-room manufacture. Tracing sheets to cut design time are also to be had.
Circle Inform-A-Gram No. B81.

Arbor Spacers and Shims for milling, slitting, and gang saw set-ups are described in current catalog from De-Sta-Co. Sets in 20 diameters ⅜" to 4", 19 graduated thicknesses .001" to .125". Specials over .125".
Circle Inform-A-Gram No. B82.

B. Jahn Production Proved Dies are described in new booklet from the B. Jahn Mfg. Co., New Britain, Conn. A graphic account of the company facilities is given, together with dozens of actual die strip photographs. Progressive dies built by this company run as many as 50,000 pieces for complete elimination of "bugs" before shipping. Booklet is invaluable to all industrial production personnel.
Circle Inform-A-Gram No. B83.

Reltool End Mills and Holders are priced and given full description in latest catalog #50 and discount sheet from Reltool Corp. Over 1000 stock sizes, many different styles.
Circle Inform-A-Gram No. B84.

Model "A" "RFC" Roll Feed is designed for 4, 6, and 8 ton presses. It cannot slip, and instant reverse is possible. Literature covering the complete "RFC" line is available from the Roll-Feeds Corp.
Circle Inform-A-Gram No. B85.

"John's" Drill Jigs save on set-up time, save on tooling costs, and speed work in many machining operations. Heuser Mfg. Co. makes them in 6", 8", and 14" sizes. Details available.
Circle Inform-A-Gram No. B86.

Brinnell Hardness Tester by Detroit Testing Machine Co. features pre-setting with foot operation and clear dial reading for adaptability and production line speeds. Catalog now available.
Circle Inform-A-Gram No. B87.

Rousselle Punch Presses give good production, low maintenance. OBI, horn, and deep throat presses are pictured and described in current literature from the Service Machine Co. of Chicago.
Circle Inform-A-Gram No. B88.

Model B860 Tool & Cutter Grinder is featured in current graphically illustrated catalog from K. O. Lee Company. All details of this low-cost machine are given.
Circle Inform-A-Gram No. B89.

Morey 12-M Vertical Profiler and Miller gives rapid, economical duplication of small parts requiring accurate interchangeability. Illustrated literature from Morey Machinery Co., Inc., gives full machine data. Features include balanced cross-slide, spline shaft spindles, one-shot lubrication, and built-in coolant system.
Circle Inform-A-Gram No. B90.

The Reich Abrasive Cent-R-Lap Tool saves time and eliminates diamond dressing. Cones are available in 100, 120, and 150 grit, and are changeable in matter of seconds. J. R. Reich Mfg. Co., 45 E. Stroop Rd., Dayton 9, Ohio.
Circle Inform-A-Gram No. B91.

Standard and Expansion Copper Head Laps may be used over and over again, changing only the sleeves for different jobs. They are available from stock in standard sizes from ⅛" through 2½" diameters from the Boyar-Schultz Corporation. A descriptive circular is also ready for distribution.
Circle Inform-A-Gram No. B92.

Geared Head Precision Gap Lathes in a size range from 16" to 28" are described in illustrated literature from the Parker Machine Co. Featured are 12 spindle speeds, built-in lubrication pump and quick change gear box.
Circle Inform-A-Gram No. B93.

CHALLENGE SURFACE PLATE EQUIPMENT

***PRECISIONED* FOR YOUR PRECISION NEEDS!**

ANGLE PLATES Provide a practical and versatile method for clamping and holding work. Challenge plates are made of high grade, fine-grained semi-steel—special heat treated and precision ground to an accuracy of .0005-inch. Made in 22 sizes, from 2½x6x12 inches up to and including 18x18x18 inches.

BOX PARALLELS: Special heat treated and precision ground to an accuracy of .0005-inch.

V-BLOCKS: Recommended for supporting shafts and other cylindrical work when drilling, checking, inspecting, etc. Made of fine-grained semi-steel castings. Special heat treated, precision ground. Ribbed sides.

RIGHT ANGLE IRONS: Made of fine grain special analysis semi-steel, specially treated. End and sides are precision ground both square and parallel.

STRAIGHT EDGES: Scientifically shaped and ribbed to retain accuracy. Made of special analysis semi-steel.

Write for complete information and prices. 584

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN

New Series of Six Neutral Salt Baths with additives is announced by the A. F. Holden Co., 97 Thornton St., Hamden 14, New Haven, Conn. These new baths do not require hourly rectification to maintain bath at full strength, give less drag-out and extended electro life. New descriptive circular is available from maker.
Circle Inform-A-Gram No. B94.

Tungsten Carbide Tools ground from the solid by the Atrax Co., Newington 11, Conn., are featured in a well set out catalog. Burs, reamers, end mills, and boring bits are among the items included.
Circle Inform-A-Gram No. B95.

Bunting Bronze Bearings and Bars are exhaustively listed in a new catalog from the Bunting Brass & Bronze Co., Toledo 9, Ohio. The catalog also contains data on electric motor bearings and complete engineering information on all products. Catalog No. 52, 73 pages.
Circle Inform-A-Gram No. B96.

Jones & Lamson Optical Comparators give unsurpassed inspection versatility, give direct readings accurate to .0001" without computation. Eleven models are made. Catalog No. 402 has full engineering data.
Circle Inform-A-Gram No. B97.

Specialized Engineering Facilities for processing and complete tooling of gasoline and Diesel engines, standard and automatic transmissions, hydraulic torque converters, and related accessories and power units are described in new folder 159-20 from the Visi-Trol Engineering Co., 9345 Hubbell, Detroit 28, Mich.
Circle Inform-A-Gram No. B98.

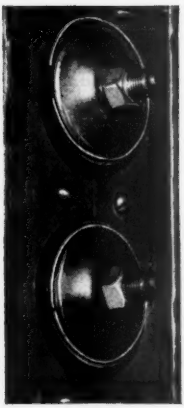
Current Issue of "Colonial Broaching News," from the Colonial Broach Company, P.O. Box 37, Harper Station, Detroit 13, Mich., includes features on blind surface broaching, allowing for stock variations, and a new ground broach finish that gives smoother work surface. Volume XIV, Number 2.
Circle Inform-A-Gram No. B99.

The P & W Electrolimit Height Gage is described in a new piece of literature from Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. The gage is particularly useful in comparing or transferring gage-block established dimensions and in checking runout, squareness, and concentricity. Illustrated applications are shown together with complete engineering data.
Circle Inform-A-Gram No. B100.

"Star-Dust" is specially graded diamond lapping compound from the Ace Abrasive Laboratories in all grit and micron sizes, packaged either as dry powder, premixed as a compound, or in special applicator gun. Brochure C-5 gives full details.
Circle Inform-A-Gram No. B101.

"Line Grind" Bands for machining hard materials such as hardened steels and abrasives and brittle materials such as glass, marble, and granite are being made by the DoALL Co., Des Plaines, Ill., for use on band machines. Complete information on grit types and suitability to different machining jobs is discussed in bulletin 48-810.
Circle Inform-A-Gram No. B102.

Stress-Relieved
NOTCH-COIL RINGS
UP SILVER BRAZING
800%



SILVER BRAZING gas strainers for refrigerators jumped from 60 to 480 per hour when stress-relieved, notch-coil rings replaced individual, machine-wound rings. Ordinary rings (top left) fell away from joint, resulting in poor bond, spillage and need for machining of brazed parts. Rejects and hard-to-handle individual rings made method too slow and costly.

STRESS-RELIEVED RINGS retained ±.001-inch tolerance at all times, permitting mass brazing. Rings snap to specified tolerance to form a gas-tight bond, and snap off coil, snap on assembly in one time-saving motion. Costs were cut 74%, rejects 95%. Waste, spillage and machining were eliminated. Rings are made from *SILFOS* and *EASY-FLO* in *any* wire thickness and diameter in *butt*, *lap* and *gap* form.

LUCAS-MILHAUPT ENGINEERING CO.
5059 SOUTH LAKE DRIVE, CUDAHY, WIS.
Suburb of Milwaukee

Angle and Radius Dressers by Sperman Metal Specialties, 1085 Rogers Ave., Brooklyn 26, N. Y., are described in a circular now available. Design is compact, allowing completely accurate dressing from underneath the wheel, avoiding the necessity of removing the grinder wheel guard. Radius up to 1½" either concave or convex.

Circle Inform-A-Gram No. B103.

Compound Microscope Base has 6" lateral and 4" traverse continuous micrometer motion. This instrument does double duty as accurate machining table and as complete toolmakers microscope. Brochure from Erb & Gray gives full data and suggested optical units.

Circle Inform-A-Gram No. B104.

Small Hole Tapping Equipment is fully described in bulletin T-471 from the Hamilton Tool Co. Functional design for precision tapping of small holes at production speeds with good tap life and better than acceptable accuracy.

Circle Inform-A-Gram No. B105.

Cardinal Speed Vise is detailed in new catalog from the Cardinal Machine Co., Glendale, Calif. Designed specially for accommodation of a wide variety of jig shapes.

Circle Inform-A-Gram No. 106.

Erickson Full Floating Holder for chuck-held cutting tools allows quick and easy adjustment to offset machine errors. Model 189 permits compensation for both parallel and angular misalignment. Catalog B from Erickson Tools Div. has full data.

Circle Inform-A-Gram No. B107.

New Bushing Catalog from Acme Industrial Co. simplifies and speeds selection, has complete data. Also includes liners, leader pins, dowel pins, etc.

Circle Inform-A-Gram No. B108.

Weldon Measuring Attachment for lathes directly computes forward or reverse carriage movement within .001". Easily fitted to any lathe. Circular LA-1 from Weldon Tool Co.

Circle Inform-A-Gram No. B109.

17 Ways of Increasing Heat-Treating Efficiency with submerged electrode salt baths on 10 specific heat-treating applications in the temperature range from 1100° F to 2400° F are described in a new bulletin from the Ajax Electric Co., Inc., 930 Frankford Ave., Philadelphia 23, Pa. Bulletin No. is 123-B.

Circle Inform-A-Gram No. B110.

Lassy Model 12F Hand Tapper, universal tap and die guide, and work holder are all described in current literature from the Lassy Tool Company. Complete ordering and engineering data given.

Circle Inform-A-Gram No. B111.

Honan-Crane Oil Filtration and Handling Equipment is described in two new bulletins by the Honan-Crane Corp., 208 Indianapolis Ave., Lebanon, Ind. Two bulletins not only give exhaustive listing of the available equipment, but also present in graphically illustrated form a very complete picture of applications cutting costs in all types of plant.

Circle Inform-A-Gram No. B112.

Salt Bath Brazing Literature from Ajax Electric Co., Inc., contains details of cost cutting possibilities of this method of fabrication. Interesting examples are given.

Circle Inform-A-Gram No. B113.

VISUAL GRIND
Now a Veteran...
Tested, Proven Successful—
IN MANY PRODUCTION PLANTS!
Continuous inspection unites with blind, straight-through and templet grinding by projection during the grinding period. This complete speedy machine handles a wider range of work than ever before. Difficult jobs in steel and tungsten carbide which required several machines are dispatched with ease and profit on Visual-Grind. Tolerances and accuracy are progressively controlled by visual reference. A precision optic system gives trueness and definition. Husky construction insures rigidity and long life.
Ask for Bulletin No. T-11
VISUAL GRIND
THE CLEVELAND GRINDING MACHINE CO.
1643 EDDY ROAD - CLEVELAND 12, OHIO

New Diamond Wheel Catalog is being issued by the Diamond Tool Research Co., Inc., 305 E. 45th St., New York 17, N. Y. Its 32 pages include ordering information, tabular and diagrammatic specifications and use hints on a complete size and grit range.
Circle Inform-A-Gram No. B114.

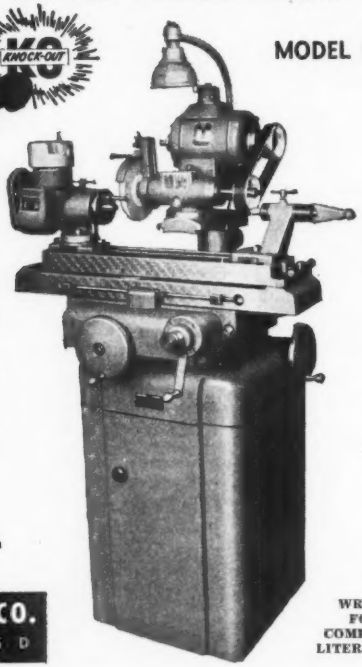
Catalog of Machine Shop Equipment from Grand Tool and Supply Co., 176 Grand St., New York 13, N. Y. is this company's first production, has just been released. It contains complete data on a variegated line of machine tools and supplies. 32 items, end mills to combination calipers.
Circle Inform-A-Gram No. B115.

Mora Universal Precision Height Gauge by Brand Tool & Supply Co., 907 S. Victory Blvd., Burbank, Cal., is featured in new catalog. The gauge is equipped with movable differential scale system, may be used with dial indicator and as dial platform gauge. Full data, prices, etc.
Circle Inform-A-Gram No. B116.

Two New Bulletins, WPH-52-2, and TH-52, from the Thompson Electric Co., 1100-11 Power Ave., Cleveland 14, Ohio, detail an outdoor or indoor lighting system that will directly cut maintenance costs by 75%. C.A.A. specification conformation.
Circle Inform-A-Gram No. B117.

There's a reason 71%
of all popularly-priced Tool and Cutter Grinders sold in 1951 were "Knock-Outs"

MODEL B860



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K. O. LEE CO.
ABERDEEN, S. D.

WRITE FOR COMPLETE LITERATURE

New Model 330 Nu-Matic Grinder is featured in a new catalog from Nu-Matic Grinders, Inc., 8224 Carnegie Ave., Cleveland 3, Ohio. This model has all the contour following flexible characteristics of the model 535, and is small for easy handling in tight spots. End plates recessed, valve repositioned for maximum accessibility. Accessories described include snagging drum, ideal for heavy duty metal removal.
Circle Inform-A-Gram No. B118.

New Descriptive Folder Tells About Improved Electropunch. This electric impact hammer has many features making it suitable for many "joining" operations of small product assembly lines. Hand or automatic switching, production to as much as 10,000 pieces per hour. Complete accessory and model range described. Black & Webster Inc., Dept. N90, 445 Watertown St., Newton 58, Mass.
Circle Inform-A-Gram No. B119.

Power Torque Tools for stud driving, nut running, and torque testing are described in current catalog from Garvin Bros., Inc., P.O. Box 536, South Bend, Ind. Hand and bench models.
Circle Inform-A-Gram No. B120.

88 Page General Catalog No. 5205 has just been released by South Bend Lathe Works, 425 E. Madison St., South Bend 22, Ind. Illustration, description, and specification for all lathes, shapers, and drill presses, plus complete attachments, tools, chucks and accessories line. Many new machine tool developments are described for the first time.
Circle Inform-A-Gram No. B121.

New Folder Describes Vulcanaire Dust Collecting Units. These are inexpensive, compact units, having no moving parts, operated from the existing air supply. Folder illustrates pictorially many different applications, shows ease of installation. Vulcan Tool Co., Dayton 10, Ohio.
Circle Inform-A-Gram No. B122.

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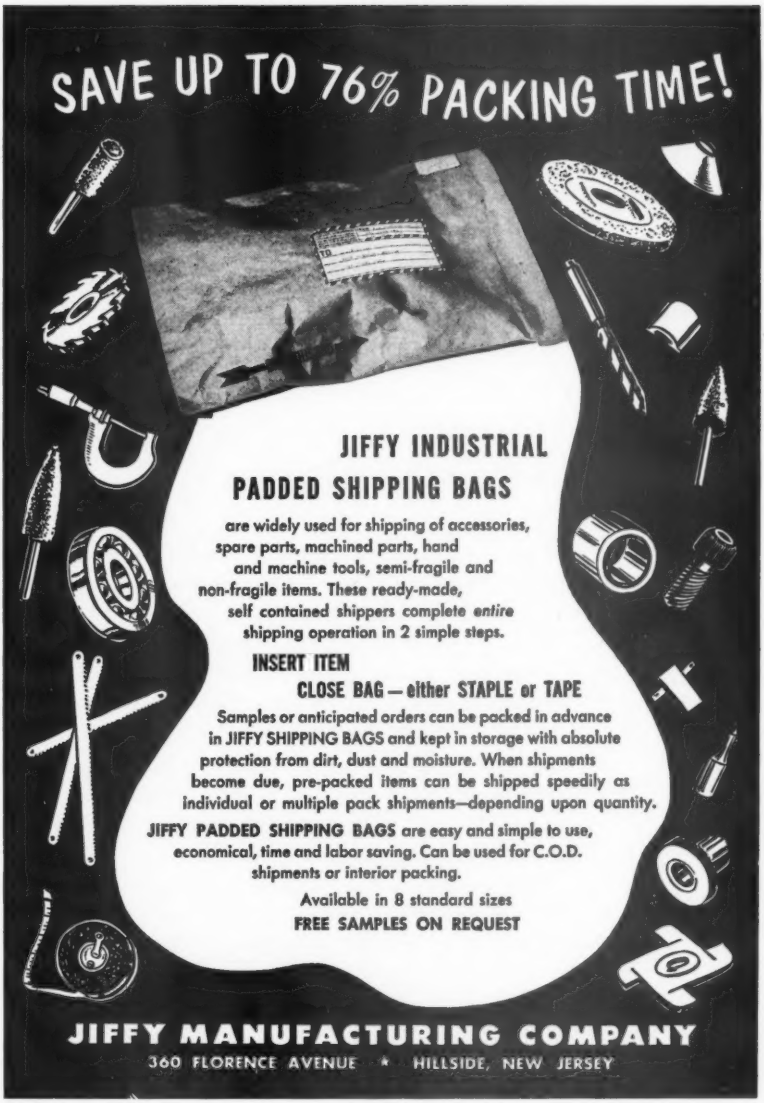

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OF YOUR DESIGNERS AND TOOLMAKERS!

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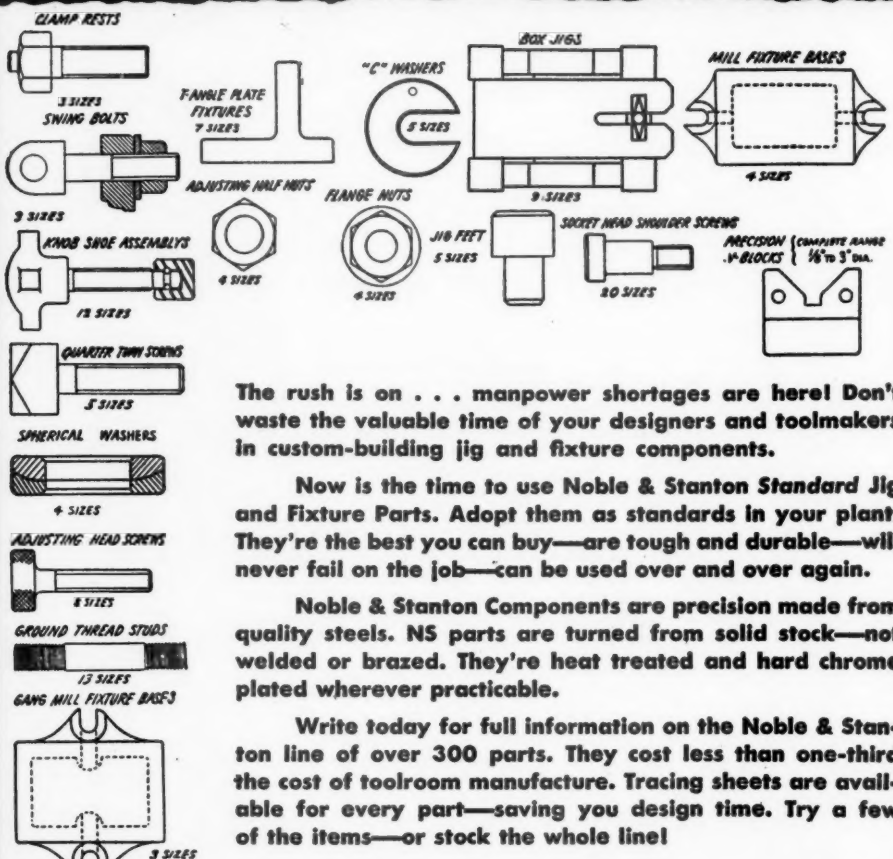

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3	18	33	49	83	111B	127	140	158A	165B	173A	179C	185C	194	198F	203
5	20	34	50	85	113A	128	141	158B	166A	173B	180A	186	195A	198G	204
6	21	35	51	87	113B	129	142	159A	166B	173C	180B	187A	195B	198H	
7	22	36	52	88	114	130	143	159B	167A	173D	181A	187B	196A	198J	
8	23	38	53	91	115	131	144	161A	167B	174A	181B	187C	196B	198K	
9	24	39	54	93	116	132A	145	161B	169A	174B	181C	188A	197A	198L	
10	25	40	55	97	117	132B	146	162	169B	175A	182A	188B	197B	198M	
11	26	41	56	99	118	133A	147	163A	170	175B	182B	188C	197C	198N	
12	27	42	57	101	119	133B	148	163B	171A	175C	183A	189A	197D	198P	
13	28	43	58	102	121	134	149	163C	171B	175D	183B	189B	198A	199A	
14	29	44	60	105	123	136	150	163D	171C	178A	184A	191A	198B	199B	
15	30	45	75	107	124	137	151	163E	171D	178B	184B	191B	198C	199C	

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3	18	33	49	83	111B	127	140	158A	165B	173A	179C	185C	194	198F	203
5	20	34	50	85	113A	128	141	158B	166A	173B	180A	186	195A	198G	204
6	21	35	51	87	113B	129	142	159A	166B	173C	180B	187A	195B	198H	
7	22	36	52	88	114	130	143	159B	167A	173D	181A	187B	196A	198J	
8	23	38	53	91	115	131	144	161A	167B	174A	181B	187C	196B	198K	
9	24	39	54	93	116	132A	145	161B	169A	174B	181C	188A	197A	198L	
10	25	40	55	97	117	132B	146	162	169B	175A	182A	188B	197B	198M	
11	26	41	56	99	118	133A	147	163A	170	175B	182B	188C	197C	198N	
12	27	42	57	101	119	133B	148	163B	171A	175C	183A	189A	197D	198P	
13	28	43	58	102	121	134	149	163C	171B	175D	183B	189B	198A	199A	
14	29	44	60	105	123	136	150	163D	171C	178A	184A	191A	198B	199B	
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A2	A15	A28	B10	B23	B36	B49	B62	B75	B88	B101	B114	C5	E6	E19
A3	A16	A29	B11	B24	B37	B50	B63	B76	B89	B102	B115	C6	E7	E20
A4	A17	A30	B12	B25	B38	B51	B64	B77	B90	B103	B116	C7	E8	E21
A5	A18	A31	B13	B26	B39	B52	B65	B78	B91	B104	B117	C8	E9	E22
A6	A19	B1	B14	B27	B40	B53	B66	B79	B92	B105	B118	C9	E10	E23
A7	A20	B2	B15	B28	B41	B54	B67	B80	B93	B106	B119	D1	E11	E24
A8	A21	B3	B16	B29	B42	B55	B68	B81	B94	B107	B120	D2	E12	
A9	A22	B4	B17	B30	B43	B56	B69	B82	B95	B108	B121	D3	E13	
A10	A23	B5	B18	B31	B44	B57	B70	B83	B96	B109	B122	E1	E14	
A11	A24	B6	B19	B32	B45	B58	B71	B84	B97	B110	C1	E2	E15	
A12	A25	B7	B20	B33	B46	B59	B72	B85	B98	B111	C2	E3	E16	
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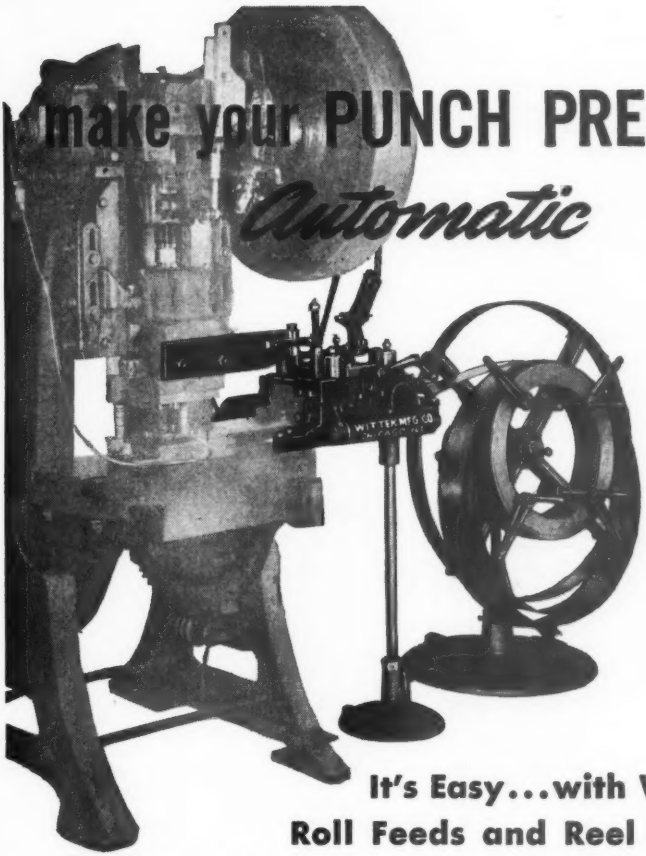

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Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions. They are reliable and accurate with simple, quick adjustment of feed length. Standard sizes and models meet a wide variety of press size and capacity conditions.

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QUICK-PIC

PRECISION

This new 32 page catalog from O'Neil-Irwin features precision metal-working machines for forming, cutting, and punching operations.
Circle No. E1.

SHELF STORAGE

"The Science of Economical Shelf Storage" is title of this new catalog. Rotary system saves up to 50% in floor space and in handling costs.
Circle No. E2.

ACCURACY

New P. & W. literature—"Stub Reamers and Floating Holders" gives full data and ordering information, also application photographs.
Circle No. E3.

IPSENLAB

New heat-treat equipment combines bright, scale-free tempering and controlled oxidation tempering in one unit.
Close control plus big time savings.
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BENCH PRESSES

Baird automatic bench power presses and attachments are fully and pictorially described in this latest catalog from the Baird Machine Co.
Circle No. E5.

BAY STATE

Mounted wheels and mounted points are subject of this new 32 page catalog, containing use hints, engineering data, tubular, and complete ordering information.
Circle No. E6.

"430"

New booklet by Sharon Steel helps remove much mystery from the use of straight chromium type stainless steels. Detailed fabricating data is illustrated.
Circle No. E7.

PRODUCTION

The number 101 centerless feed polishing machine by the Production Machine Co. is described in this new catalog. No chucking, centering, or holding necessary.
Circle No. E8.

*** 0.00001" ***

Optical level checks flatness, straightness, and parallelism; deviations from horizontal measured instantly to 0.00001" per inch of length. F. T. Griswold.
Circle No. E9.

PLANER DRIVE

Variable speed planer drive provides rapid and accurate reversals with great control flexibility. Full data in bulletin D-2306, Reliance Electric & Engineering.
Circle No. E10.

HACK SAW BLADES

New brochure from DoALL gives data on complete line of hand and power blades. Speed and feed and ordering information in tabular form.
Circle No. E11.

COUPLINGS

Cone-Drive Standard Bore flexible couplings are very completely described in new bulletin CDC-52 from the Michigan Tool Company. Illustrations and tables.
Circle No. E12.

CATALOGS

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CHASER SHARPENING

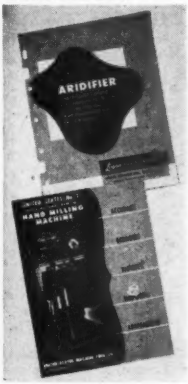
J & L universal bench type chaser sharpening machine does quick accurate job even with unskilled labor, frees expensive machines, saves space.

Circle No. E17.

FLARING TOOL

This catalog sheet from the Imperial Brass Mfg. Co. gives information on their tool for flaring copper, aluminum, and brass tubing.

Circle No. E18.



CYLINDERS

Air, hydraulic, and water are featured in bulletin 101 from the Ortman-Miller Machine Company, Inc. Very complete eng'g. data and charts on a complete line.

Circle No. E13.

GEAR HOBBING

Mikron No. 102 gear hobbing machine is for spur, spiral, worm and straight bevel gears; with attachments will form multi-start internal threads.

Circle No. E14.

ARIDIFIER

This Logan product removes moisture, scale, and other impurities from air and gas lines by combined centrifugal and deflective action. Catalog has all data.

Circle No. E21.

HAND MILLER

No. 1 full anti-friction bearing hand milling machine by U. S. Machine Tool Co., has accuracy, economy, rigidity, simplicity, and adaptability.

Circle No. E22.

COMMANDER

Commander production tools are described in this attractive 12 page brochure. Tappers, multiple drill units, chip breakers and coolant tables featured.

Circle No. E15.

COLLET CHUCKS

Hall collet chucks incorporate positive adjustment for high production, are of push-out type. Bulletin fully describes features.

Circle No. E16.

HYDRAULICS

New bulletin 701 is valuable reference work on air and hydraulic cylinders. It is complete with diagrams, photos, and charts, plus engineering data.

Circle No. E23.

PIPE & TUBING

Babcock & Wilcox bulletin TDC-144 contains all data on Croloy pipe and tubing, includes corrosion resistance, creep-strength, etc.

Circle No. E24.

DRILLING AND TAPPING

Beckett-Harcum drilling and tapping machinery of single and multi-spindle, floor and bench types, is featured in this latest catalog.

Circle No. E19.

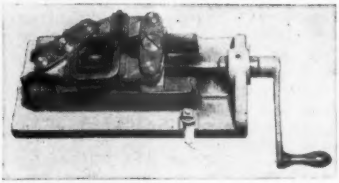
INDUSTRIAL FURNACES

Comprehensive literature is now available from Sargeant & Wilbur, Inc., on a line of furnace for all industrial purposes. Many different models.

Circle No. E20.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR KEY NUMBERS

CLAMPMASTER



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Eliminates fixtures for the holding of odd-shaped work pieces. Quick adjustment for positive holding of round, elliptical, tapered, triangular, or irregular shapes. Two moving jaws for quick centering of work. Available in four sizes for bench or machine work of all types.

THE VISE OF A THOUSAND USES

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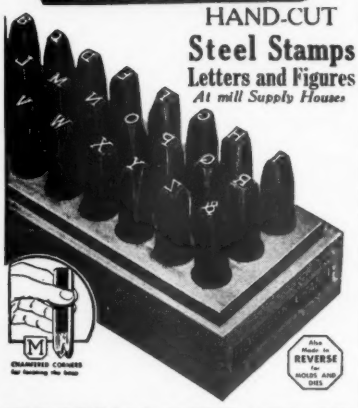


HOGGSON & PETTIS MFG. CO.
141D Brewery St. New Haven 7, Conn.

. . . **Tipped Tools, from page 63**

greatest extent for brazing cemented carbide tips and pre-hardened H.S.S. tips to their shanks. These materials have a joining temperature in the range of 600° to 700° C.

Silver solder usually is applied by pre-coating ("tinning") the tip, shank, or both; by placing a shim in the joint; or by supplying the brazing medium from a filler rod. Pre-coating or "tinning" is recommended particularly for those applications where even a small percentage of joint failures cannot be tolerated. Pre-coating of cemented-carbide tips of compositions high in titanium, tantalum, or both, often is recommended, since tips of these materials are more difficult to braze.

The second general type of brazing medium is used where it is desired to join the tip and shank at a temperature between 1000° and 1250° C. These brazing alloys are used especially for brazing cemented carbide tips on tools which will encounter considerable heat in service. They also are used in applications where it is desired to combine, in one operation, the joining of a high-speed-steel tip to a shank and the hardening of the tip. The higher-temperature brazing mediums may be applied in the same fashion as the

(Continued on page 166)

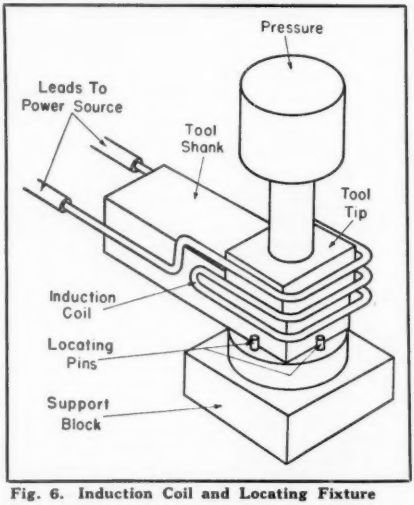
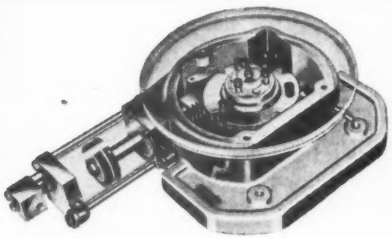


Fig. 6. Induction Coil and Locating Fixture



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"Bottle Neck Capped"

Process men at Morton Machine Works, ever alert to the value of incorporating their own parts in their own jig and fixture design, recently solved a Rush-Rush demand for a replacement drill jig by using six of their standard jig and fixture parts: three pieces of cold rolled steel and a standard replaceable bushing for its construction.

The jig was needed for "yesterday's production schedule so heat treating and grinding were "out". The "print" called for a 3/16" hole to be drilled and reamed in a rectangular steel blank. This hole was dimensioned from two edges of the blank with limits of plus or minus .005; rate of production—120 per hour; machine available — Walker-Turner bench drill—¼" capacity; loading and unloading had to be rapid.

A single cam (SC-1) equipped with a

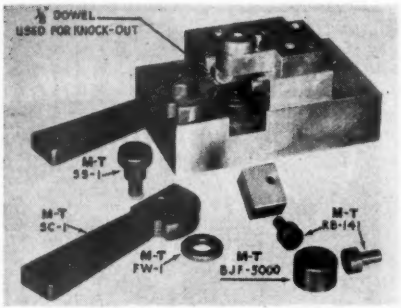


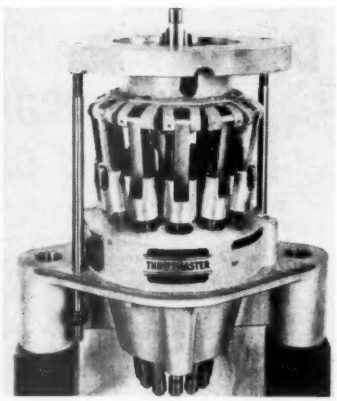
Photo courtesy Morton Machine Works.

⅛" dowel for knock-out solved this need. Utilization of two rest buttons (RB-141) and one button jig foot (BJF-5000) answered the need for hardened and ground wear and locating surfaces. Design and build elapsed time was under eight hours.

Special Angular Type Fixed Center Drillhead

A 12-spindle fixed center drillhead has been developed which has solved a vital production problem for a number of defense contractors. The unit illustrated at right is used for drilling twelve ¼" holes set at 10° angles and located on the flat surface near the periphery of a steel part. Using this special drillhead the part, a trap in a 3.5" high explosive Anti-Tank Rocket, is drilled to a size tolerance of .001" in a single pass under power feed of .004" per revolution at approximately 1000 RPM. The trap is illustrated below.

The special fixed center drillhead has a 1:3 gear ratio. Spindles feed drills in at angles thru linkage with drill press non-rotating round quill while gear train and



housing remain stationary. This head is ruggedly built and has proved its ability to stand up on this job under drilling loads to the point of drill disintegration.

The balance of the holes in the part are multiple drilled by using a conventional rotary indexing table and a standard drillhead.

Photos courtesy Thriftmaster Products Corp.

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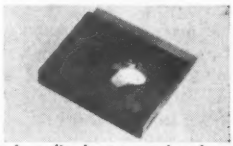
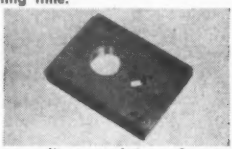


Above is a die, heat treated under ordinary conditions. Note—scale, pitting and decarburization necessitating hours of costly polishing time.



The same die treated in a few seconds with PHOENIX-BRAND NON-SCALING COMPOUND. Note — clean, scale-free surface — No polishing necessary.

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Brooks and Perkins Incorporated, have adopted toggle clamps as part of their stress relief fixtures for magnesium assemblies. Specifications of an army order on radar cabinets require stress relief of all extruded sections that are welded together to prevent the development of weld cracks in service. Distortion of the cabinet sections would disrupt the delicate electronic equipment of the radar sets making them useless.

When the extruded sections have been welded together with the equipment mounting blocks, and angle plates, the assembly is fastened to the fixture. Then it is rolled into a furnace where the temperature is brought up to 500° F for one hour before allowing to cool. The high temperatures have caused cracks to develop in the asbestos backing of the fixture but the clamps have retained their snap-action holding pressure.

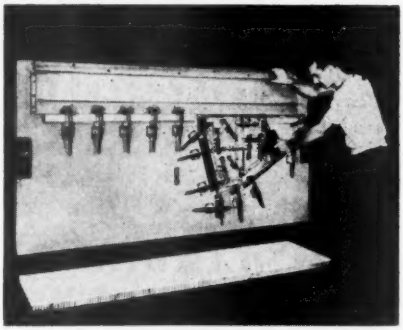
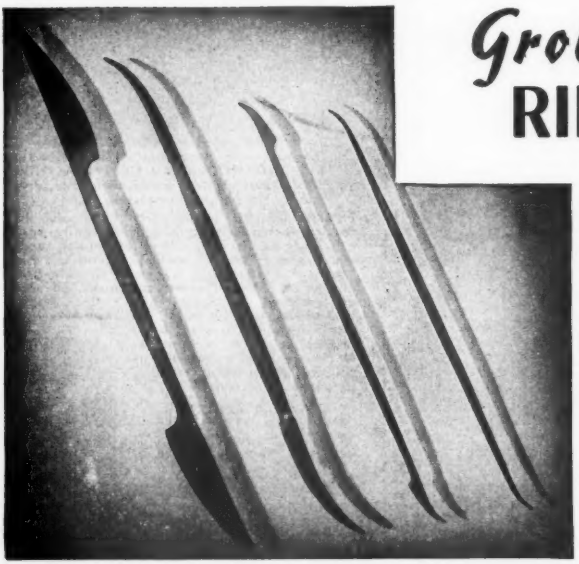


Photo courtesy Detroit Stamping Co.

After the radar console cabinet is completed, it is again placed in the furnace for additional stress relief before shipment to its destination.



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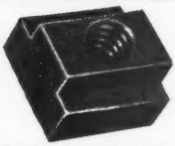

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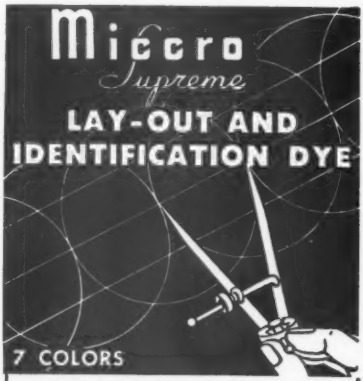

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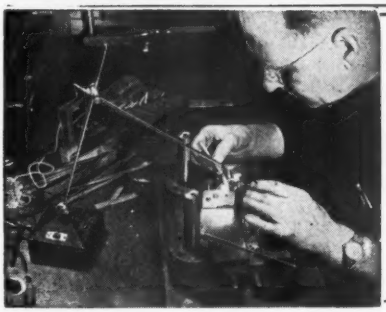

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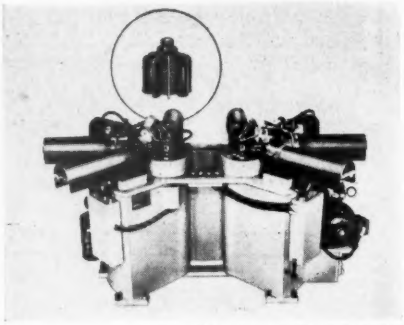

Photo courtesy Black Drill Co.

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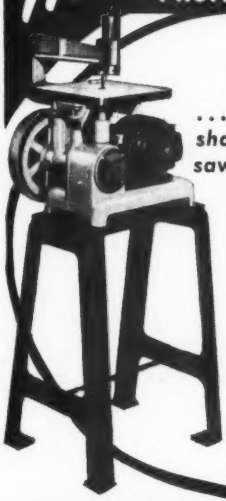

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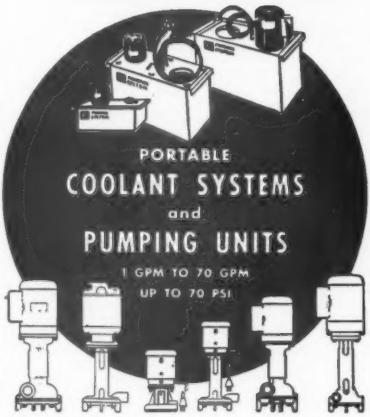

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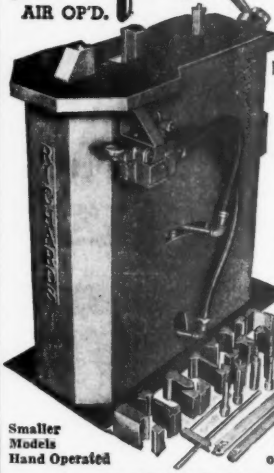
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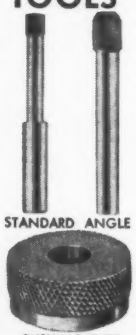
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. . . Tipped Tools, from page 158

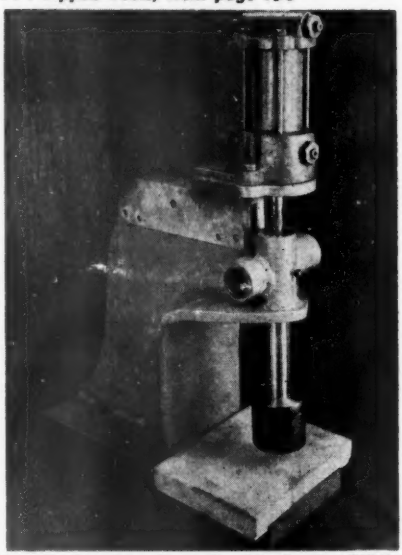

Fig. 7. Quenching Press, Used in Brazing H.S.S.-Tipped Tools

silver solders (pre-coating, using an alloy shim in the joint, or from a filler-metal rod).

Another method of applying the brazing medium which has produced satisfactory results and which, it appears, would be particularly applicable to large-scale production, is illustrated in Figure 5. Here, the brazing metal is being sprayed on the tips and shanks. By this method the material may be applied uniformly in a very short time. The labor involved in cutting out and locating shims or strips of brazing material is thereby utilized more efficiently.

As shown to the right in Figure 5, the tool tips may be held on a magnetic chuck so that the blast from the metal spray gun will not blow the tips off the table. It may be found that some grades of cemented carbide are not sufficiently magnetic to hold well on a magnetic chuck. When this condition exists, the tips may be held in place by laying strips of magnetic steel around the tips, in the same manner that many non-magnetic materials are held on magnetic chucks for grinding.

(Continued on page 174)

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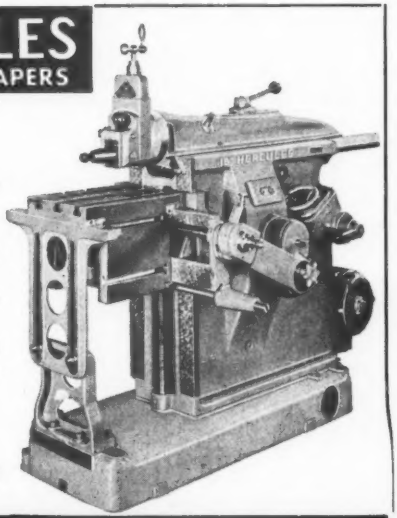

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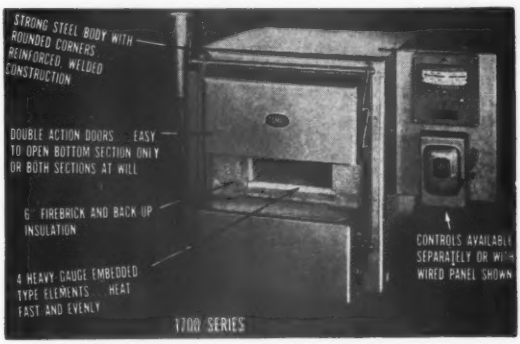
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Bench-Type Machine Speeds Tube Reaming, Deburring, and Facing Operations

For many years, it has been common practice for plants to handle pipe and tube deburring, reaming, and facing operations on standard-type machines such as lathes, or in some cases, employ slow hand filing methods. Obviously, for production work, neither method has been satisfactory from the standpoint of efficiency. It is of interest, therefore, to note how Turner Brass Works, Sycamore, Illinois, have stepped-up efficiency in handling a variety of reaming and inside and outside deburring operations on welded steel tubing. With a new standard Bench-Type End-Finishing Machine shown in Figure 1, these operations are now completed at speeds approaching special machine output. The savings in time are largely due to the design of the machine which enables the operator to clamp and feed the work to the cutting tools with a single forward movement of a hand lever. Because the operator has one hand free, faster stock handling and loading is possible. Workpieces are automatically released by simply reversing the hand lever. For depth of cut, an adjustable swing-type stop operated by the feed rack provides fast and accurate positioning and gaging.

Photos courtesy Pines Engineering Co., Inc.

Fig. 1. Bench-type End-Finishing has stepped up efficiency in handling of reaming, and inside and outside deburring operations on welded steel tubing.

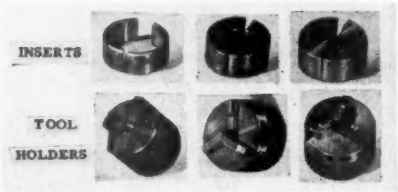

Fig. 3. Left. Three typical sizes of inserts for holding ¼", ¾" and 2" O.D. stock. At right are three different types of tool holders.

new machine is afforded by the results obtained on three typical workpieces shown in Figure 2. It is significant also to note that the machine is designed so that change-overs from one job to another can be made quickly and easily—usually in one minute. Interchangeable chuck inserts and tool holders for different operations are provided. The chuck jaws are designed with split-type inserts.

The machine illustrated handles stock up to 2" in diameter. It is a portable unit, has a three-speed sheave, ½ H.P. motor, weighs only 170 pounds. Three typical sizes of inserts, shown above in Figure 3, are for ¼", ¾", and 2" OD stock. Three different types of tool holders are shown at the bottom.

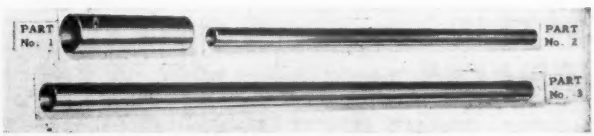

Fig. 2. Part #1—⅞" x .035" x 4½" long welded steel tubing. Both ends reamed at 636 ends per hour.
Part #2—¼" x .035" x 16" long. One end reamed at 880 per hour.
Part #3—⅝" x .049" x 32" long. Both ends deburred 700 ends per hour.

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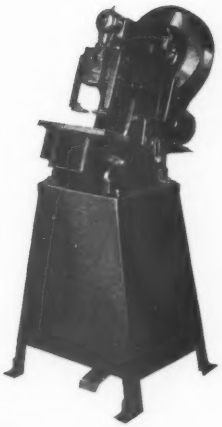
PUNCH PRESS



Small, powerful inclinable punch press that can be tilted to a maximum of 25°. Flywheel at rear permits easier feeding of stock; also provides greater margin of safety. Rated at 275 strokes per minute; length of stroke is 1"; capacity 5 tons. Has non-repeat clutch.

Throat Depth—6"
Throat Height—7"
Floor Space—29" x 22"

WHITNEY · METAL TOOL COMPANY
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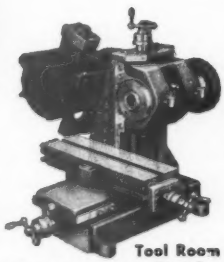
The BARKER "MILLER"
Will Efficiently Handle
"101 TRICKY"
Second Operation Jobs on SMALL PARTS ordinarily requiring larger, expensive milling machines

Production Model

The Barker exclusive 3-way travel feature affords versatility of operation.
Rapid production rate with inexperienced help. Easy set-up for small run jobs.
Compare Barkers "plus" features with other small "millers," then decide.



Tool Room Model
3 Micrometer feed screws. Ideal for instrument mfgs. and tool and die shops.

Dealers Write for Proposal

TYPICAL END MILL OPERATION UTILIZING HEAD MOVEMENT ONLY

WRITE FOR LITERATURE AND COMPLETE INFORMATION

BARKER ENGINEERING COMPANY 500 GREEN ROAD CLEVELAND 21, OHIO

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Tank Part Pull-Down Broaching Machine

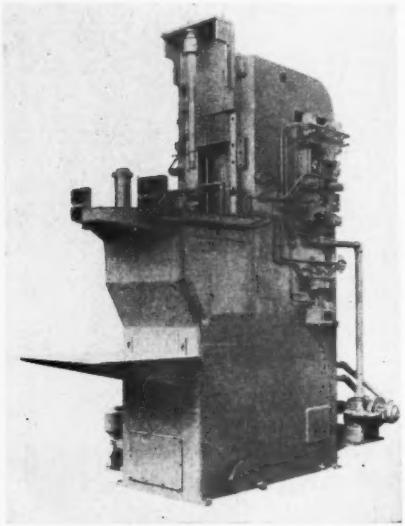

Photo courtesy American Broach & Machine Co.

The pull down broaching machine illustrated is one of three machines recently completed for a manufacturer of tank parts. The machines are equipped with interchangeable base fixtures and tooling for broaching the round and serrated holes in seven different tank arm and spindle parts. The holes broached are approximately 3¾" to 3½" in diameter.

Inherent stability has been built into the machine by having the machine slide and retriever slide move on the same ways. The retriever guides the rear end of the broach down through the major portion of the cutting stroke. With the broach held securely at both ends during most of the cutting stroke, misalignment and vibration is minimized. An electrical interlock between the retriever and machine cycle automatically stops the cycle if, by any chance, the pull head should fail to connect with the broach. The hydraulic receding work slide, which is also interlocked to the machine cycle, facilitates loading and increases productivity. This machine is ideally suited for the broaching of parts too heavy or awkward to handle on a pull-up broaching machine.

767 STANDARD SIZES OF MARSHALL STEEL PRECISION GROUND FLAT STOCK

The world's largest range of sizes of precision ground tool steel in three grades are available, ready for immediate shipment and the layout bench.

WATERcrat: A fine grained electric furnace high carbon tool steel. It has been wet ground to remove all bad surfaces and to assure velvet finish of virgin metal.

OILcrat: An outstanding product of careful handling assures you of a fine grained electric furnace oil hardening ground flat stock ready for the layout bench.

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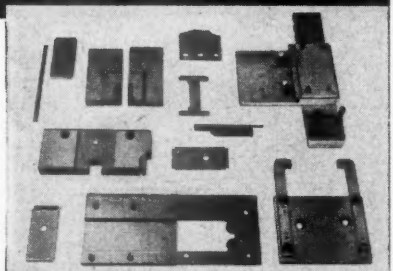

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LA GRANGE, ILLINOIS

The Aristocrats of Ground Tool Steel

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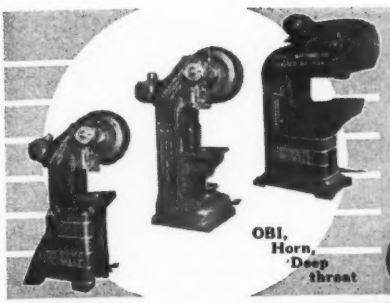

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For precision fitting, checking clearances, inspection and production work. Available in 12" strips, ½" wide, in cellophane, packed 12 pieces of one thickness to a box; also in 25-foot coils. 14 standard thicknesses from .0015" to .015".

DESTACO DETROIT STAMPING COMPANY
344 MIDLAND AVENUE • DETROIT 3, MICHIGAN

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Dual Spindle Vertical Grinder

Designed for operator convenience with increased production, the new dual spindle vertical grinder shown has individually operated spindles with individual controls which are not interlocked, and self-centering centrifugal chucks. These features permit an easy, natural, rhythmic operation almost continuous in nature without undue attention or fatigue.

On production work the left hand spindle may be in operation while the right hand spindle head is retracted for unloading and loading. Work is set in the chuck of the non-operating unit and as the table begins to revolve, the centrifugal force causes the jaws to grip the work firmly through the grinding cycle. When the table stops at the end of the cycle the jaws automatically open with the cessation of the centrifugal force and the operator lifts out the finished piece to replace it with unfinished work for the grinding operation. Completion of the cycle on the left hand spindle a short time later permits unloading and loading of this unit while the right hand spindle is still in operation. The illustration shows the left hand unit operating while the head of the right hand unit is retracted for loading.

A typical automatic cycle which is identical for the two production units is:

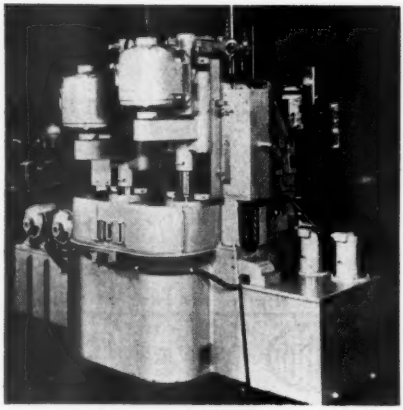

Photo courtesy Springfield Machine Tool Co.

rapid traverse until wheel contacts work; grinding feed then starts automatically and when completed, with final sizing and fine finish, a quick return of the wheel head to starting position.

Panels at the operators position have switches which set the cycle for either automatic or manual control of the entire unit and include work table operation, coolant flow, head setting, compensation for wheel wear, cycle re-set, hydraulic unit, grinding head, and diamond dresser actuation.

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RADIUS DRESSER $34.00
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Special Size Angle and Radius Dressers Made to Order. Send for Quotation.

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Hardened shaft—Bearing adjustable for wear. Diamond always perfectly centered. Easily set adjustable 180° stops.

10" Wheel size for DoALL and NORTON Grinders—$39.00. Diamond $7.00.

SPECIAL 14" Wheel Size $89.00.

Ball Thrust Bearings. 24 Precision Ground Surfaces. Can be set very accurately with a Protractor. Works underneath the wheel. Large bearing surfaces.

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STOP-PINS
AVAILABLE IN 3 SIZES

FINGER STOPS
IN 3 SIZES

STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices. GARBERDING FINGER STOPS made in uniform width to fit any standard width slots. Just grind ends to fit.

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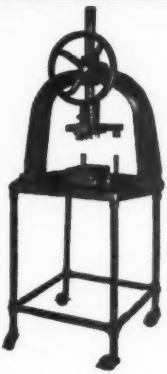

COMPLETE THE DIE-SET AT YOUR BENCH

Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the diemaker to complete a die-set right at his bench . . . saves toolroom and handling costs. Ask today for full details.

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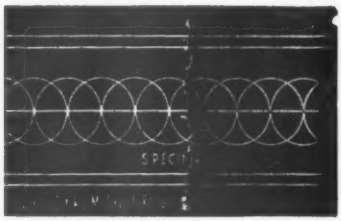

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STOPS LOSSES

making dies and templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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STOP DUSTS

INSTANTLY *with*

DUSTKOP

Available from stock of 22 standard models

300 cfm to 10,000 cfm

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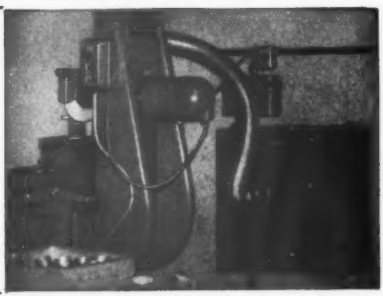

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DON'T SCRAP IT!

Ever have a tap or drill break in an expensive part? . . . so that even careful drilling couldn't save it? Today, parts costing as little as 50c can be economically salvaged by an Elox Electron Drill.* They're real money savers! No plant can afford to be without one. Write for particulars.

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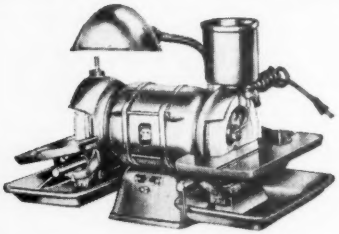
Carbide Tool Grinder

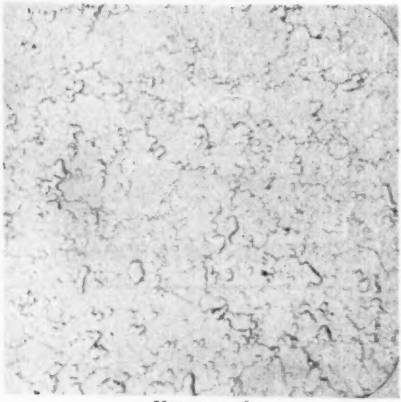


For precision work

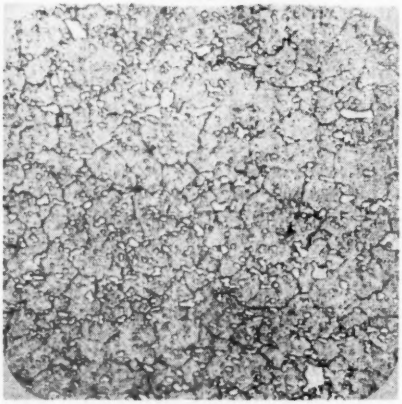
Short wheel and bearing centers, heavy shaft, large ball-bearings, dynamically balanced armature and weight-balanced wheels provide rigidity and smoothness necessary for precision work. ½ hp, 3400 RPM reversible motor. $142.60 complete.

Mail this ad for Bulletin No. 341-B **BALDOR ELECTRIC CO.**
4368 Duncan Ave., St. Louis 10, Mo.

. . . Tipped Tools, from page 166



Untempered



Tempered

Fig. 8. Microstructure of a H.S.S. Tip Brazed and Hardened in One Operation

Assembly

Figure 6 shows a method by which the tip and tool may be located and held while heating. This setup has proved useful for brazing, since the tip and shank may be held in position during the early stages of heating; the pressure may then be removed for "wiping" in the tip, and reapplied to squeeze out the excess brazing metal and slag. Once the filler metal has "set", carbide tools may be set aside for cooling. The jig shown in Figure 7 will accomplish this, as the copper blocks carry away the heat quite rapidly. The

(Continued on page 186)

HARDNESS TESTING
has been done with the
SCLEROSCOPE
since 1907

THE SHORE INSTRUMENT & MFG. CO., INC.
90-35 Van Wyck Expressway
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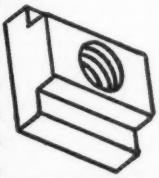

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Stud Sets
Strap Clamps
SURE GRIP STEP BLOCKS
TIETZMANN TOOL CORP.
313 N. Main St., Englewood, Ohio

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- *for fine precision work*
- *for continuous production*
- *for extreme ease of operation*

A high precision, sturdily constructed, widely adaptable machine for engraving steel stamps, dies, other metals, plastics, fibre, wood, etc. By simple attachment of additional accessories, this machine may also be used for ELECTRICAL MARKING and ACID ETCHING.

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MANUFACTURERS OF STANDARDIZED DRILL JIG AND FIXTURE BUSHINGS

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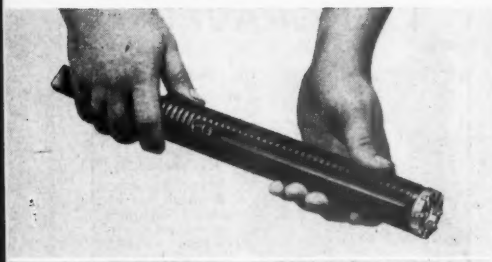
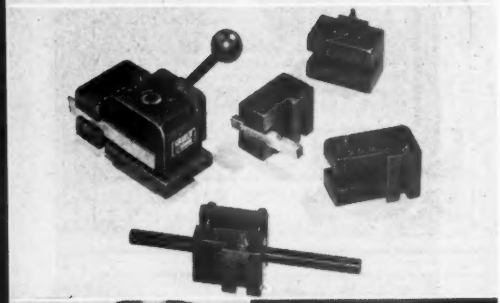
PROGRESS

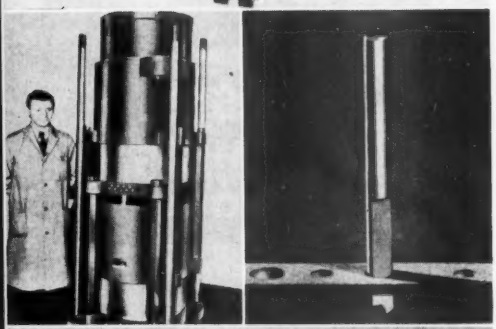
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



New Tilden Core Drill is capable of cutting drilling time 80% and drilling costs per foot 50%. Design features eight tungsten carbide cutters, giving accurate results over a long term even in castings with excessive sand and hard-chilled surface spots. The core is removed by means of the patented core slot in the side of the drill body. Range available—¾" to 4" dia., to 36" long, plain or twist drill pilots. Tilden Tool Co., San Clemente, Calif.
Circle Inform-A-Gram No. A1.

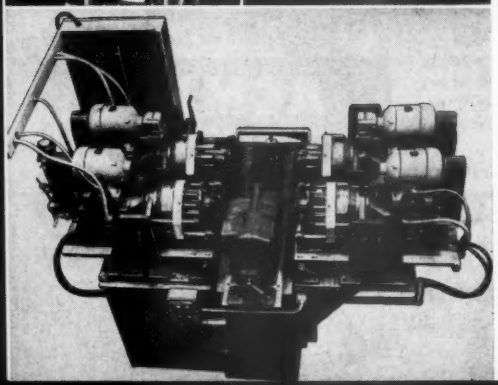


A New Tool Holder with component boring adapters fits all standard engine and turrent lathes. Features include vertical adjustment without moving bits in holders; elimination of shims for height adjustment; positive repeating with unlimited number of tool bits or operations; tool bits may be removed for sharpening without altering set-up. The unit repeats to within .0003". George E. Kirkelie Co., 8717 Darby Street, Northridge, Calif.
Circle Inform-A-Gram No. A2.



Tandem Type Die Cushion Design for large punch presses. This Model CC-24-12 die cushion from the Dayton Rogers Mfg. Co., Minneapolis 7, Minn. produces draw ring holding pressure up to 45 tons. With the use of a combination reducing regulator valve and pressure gauge, it is possible to keep this pressure nearly constant on all deep drawing requirements throughout the press work cycle. Centralized lubrication equipment provided.
Circle Inform-A-Gram No. A3.

New "Super Hard" Drill Sizes. The Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich., recently announced an increase in stock range to 11 sizes: ⅛" to ½" in the standard round shank style (solid carbide end) and 10 sizes: 5/16" to ¾" in hex shank (carbide tipped) style. In the drilling of tools, dies, fixtures, etc., requiring corrections after hardening, these drills with their special grinds have demonstrated big increases in efficiency and up to 200% greater strength than conventional type hard steel drills.
Circle Inform-A-Gram No. A4.

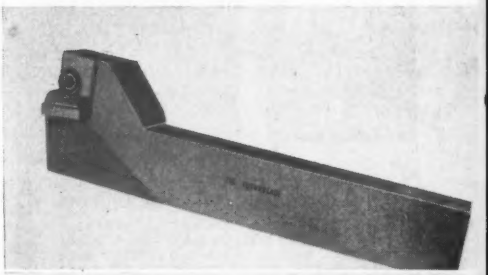


Automatic Drilling and Tapping Machine for transmission cases is designed and built by Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio. The illustration shows a view of the machine from the upper front. The machine drills and taps six power take-off holes on each side of seven different transmission cases. Angular, side, and vertical adjustment is provided. Four Zagar hydraulic feeding units and four gearless drill heads are combined with a transfer unit to give a completely automatic cycle. Central lubrication system.
Circle Inform-A-Gram No. A5.

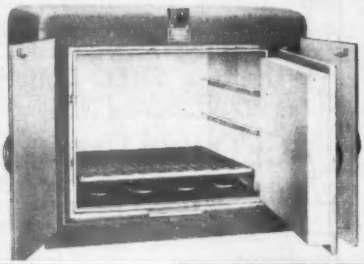
S ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

Indexable Solid Carbide lathe turning and facing tool, called "Futurblade," is now produced by the Detroit Milling Cutter Co., 28625 Grand River Avenue, Farmington, Mich. Great rigidity from micro-finished seat and blade. The latter is indexable 8 times, and has special chip breaker and cutting angles adjustable for facing or turning. Modifications are possible for shell turning on tracer lathes and for employing round inserts. If required, regrinding service is available at less than 19¢ per cutting edge from the maker.
Circle Inform-A-Gram No. A6.



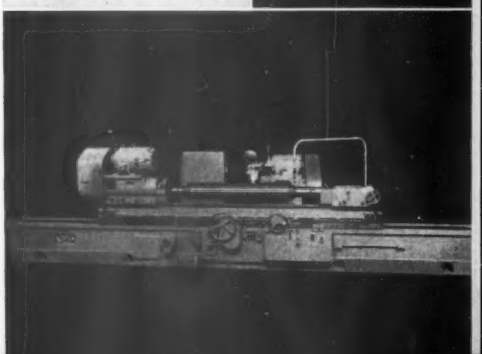
Model HT-2 1000° F Portable Oven incorporates Iconel sheathed sealed tubular heating element, has thermostat control and stainless steel interior. General construction is of heavy gauge steel with a minimum of 4" of Fiberglass insulation. Drip pan, lower shelf, pilot light and outside reading thermometer are standard equipment. Additional shelves and automatic timer are available. Grieve-Hendry Co., Inc., Chicago 22, Ill.
Circle Inform-A-Gram No. A7.



A Micrometer Stop Countersink with a non-rotating head and positive-lock adjustment is now available from Severance Tool Industries Inc., 730 Iowa Street, Saginaw, Mich. Adjustment is in 1/000" increments throughout full range from zero to maximum depth. The non-rotating feature makes it unnecessary to hold the stop unit from revolving with the free hand. Method of attaching cutter to gun minimizes overhang for close-quarter work.
Circle Inform-A-Gram No. A8.

"Gritcloth," by Bay State Abrasive Products Co., Westboro, Mass., is new sanding material which has been proven by factory tests to have a wear life from 10 to 15 times as long as that of conventional type papers. Gritcloth's abrasive is imbedded in a tough open-mesh fabric that holds the abrasive firmly, but prevents clogging by allowing the removed stock to flow through the holes in the mesh. The material is available in all usual finer grits, can be used wet or dry, flat or folded, on sanding machines or by hand.
Circle Inform-A-Gram No. A9.

New Norton Type C-2 Cylindrical Grinder is heavy-duty machine built in plain or semi-automatic styles in 18", 24", or 30" swing, and in work lengths of 48", 72", 96", 120", 144", or 168". This machine has a fast grinding action and new features which simplify set-up and operation and minimize maintenance to provide the means of lowering costs in grinding large cylindrical work. Full data may be obtained from Norton Co., Worcester 6, Mass.
Circle Inform-A-Gram No. A10.



STOP WEAR on Die Sets

. . . with ACRO Pin Oilers

Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminates bushing wear, leader pin scoring, and maintains die accuracy.

Write for FREE Bulletin
describing Acro products
Ask for Bulletin TD-30.

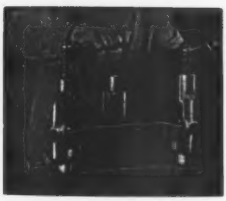
ACRO Metal Stamping Co.
330 E. Reservoir Ave., Milwaukee 12, Wis.

WHICH ARE YOU USING?

. . . the grunt-pull, hammer-wrecking bar, costly method of die separation . . . using two or three men? Results are pinched fingers, scored pins, battered dies and waste of time and money.

OR

. . . the modern efficient method that is now in actual use by hundreds of leading plants and die shops* —The Acro Die Set Puller method. Write for free information. Ask for bulletin TD 1250.



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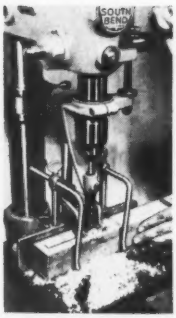
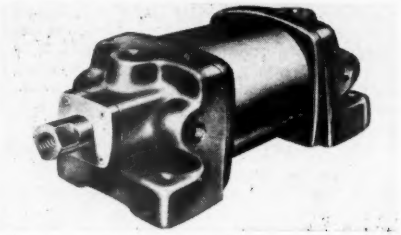
ACRO METAL STAMPING CO.
330 E. RESERVOIR AVE.
MILWAUKEE 12, WIS.



Mortising Attachment. This is a new development from the South Bend Lathe Works, South Bend 22, Ind., consisting of a fence assembly, a mortising chisel holder and three sizes of chisels and bits; ¼", ⅜", and ½". The attachment has flexible adjustment for capacity of 5-11/16" under the forked hold-down and 4-7/16" between guide arms and fence.
Circle No. A11.

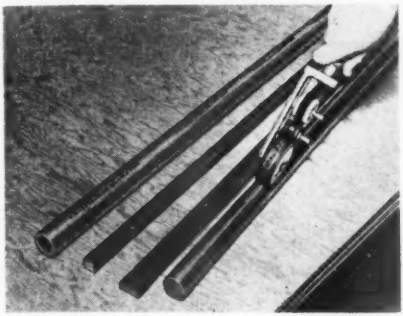
Air Cylinders. A new and complete line of high and low pressure hydraulic and air cylinders is announced by the Excel Machine & Mill Supply Co., Williamsville, N. Y. Featured are clean, accurate design, improved self-



adjusting rod packing and leak proof adjustable cushions. The line covers all popular bores between 1½" to 12" diameter, and up to 48" stroke. High pressure cylinders are designed for 2000 PSI service, low pressure cylinders for service up to 800 PSI. The line is built to JIC standards, available in four mountings.
Circle Inform-A-Gram No. A12.

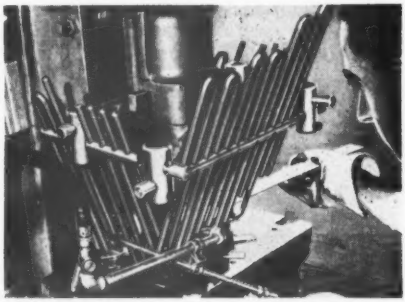
Off-Center Flute Design gives the "Quad," by M. A. Ford, a fast, economical, and chatterfree action in countersinking, chamfering and burring, valve seat finishing and center reaming operations. This tool may be successfully used in power equipment at speeds from 25 to 5 SFM, a fine finish being obtained when operated dry at low speeds. However, a water soluble coolant or cutting oil is recommended for top finishes. M. A. Ford Mfg. Co., Inc., 817 W. River St., Davenport, Iowa.
Circle No. A13.

Rolamarker 601 is a new high speed manual device for marking material, purchase order, or other information on nearly any conceivable type and form of stock. It makes possible the imprinting of a 3/16" deep by 8" long permanent legend in a continuously repeated



pattern in one quick operation over the entire material length. This full length marking allows stock to be positively identified regardless of how many cuts have been taken, takes less time than painting, stenciling, or rubber-stamp methods. Descriptive literature RAM 601 from Adolph Gottscho, Inc., Hillside 5, N. J.
Circle Inform-A-Gram No. A14.

This New Basket Enclosure Type Guard for punch presses was recently released by Searjeant Metal Products, Inc., Box 71, Mendon, N. Y. It may be ordered in several sizes each



custom-built to order. The front and side barriers may be tilted in or out as required, while the vertical rods may be adjusted up or down to clear die straps and other accessories. The front barrier may be removed very quickly, and slotted mounting brackets permit quick and easy installation or removal of the guard as a whole. A clear view front may be ordered as optional equipment to be installed in place of some of the front vertical rods.
Circle Inform-A-Gram No. A15.

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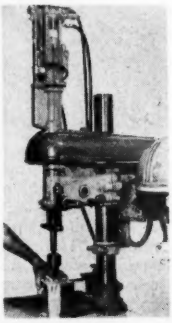
Available with GM Sleeves, Morse taper or drill chucks.
Write for full information.

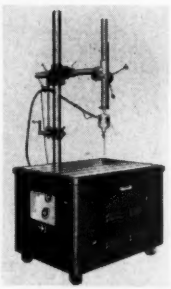
LINDERME ENGINEERING & SALES
8132 PURITAN DETROIT 21, MICHIGAN

New Clausing 18" Drill Press offers many features for greater accuracy, capacity, and efficiency, is ideal for production, tool room, maintenance and service shops. Outstanding features include: sealed-for-life and thrust absorption bearings on quill and drive spindle, 6½" spindle travel. Full details—Clausing Div., Atlas Press Co., 2312 N. Pitcher St., Kalamazoo, Mich.
Circle No. A16.



Automatic Deep Hole Drilling Unit by the General Detroit Corp., 2200 East Jefferson Detroit, uses step-by-step feeding principle, can be readily installed on most drill presses. The first cycle is rapid approach to work, the second infinitely variable feed to predetermined step depth, and the third automatic rapid retraction for chip clearing—coolant entrance.
Circle No. A17.

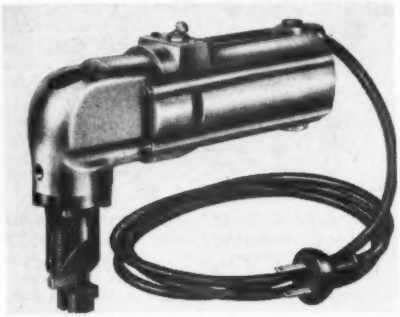
New Airflex Pneumatic Riveter has been added to its line by Lemert Engineering Co., Plymouth, Ind. It is designed to meet the requirements of automotive, electronic, and other fields. Rotating hammer with blows regulated as to force, rapidity, and duration, is featured. Semi-automatic.
Circle No. A18.



New Model 1-S Metal Disintegrator by Electro Arc Mfg. Co., PO Box 448, Ann Arbor, Mich., has improvements including 28½" x 39½" tables, and screw-fed radial arm adjustable through 360° in all planes for fast set-up and versatility. Will remove in 3 mins. a ½-13 tap broken 1⅝" deep in any metal without damage to work.
Circle No. A19.

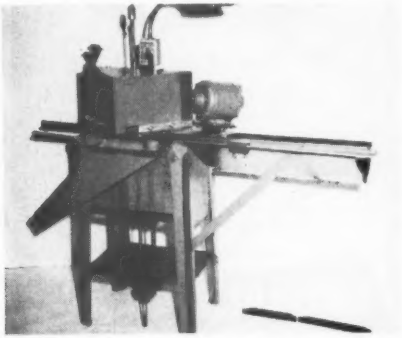
Heavy Duty Portable Nibbler cuts 14 gauge stainless steel, C.R. steel, galvanized iron and softer materials without causing distortion on either side. It is made by Fenway Machine Sales Co., Inc., 20 South 15th Street, Philadelphia 2 Pa. It will also cut holes in tubes and ducts without in any way damaging the original contour, and either to be used as a hand or a bench mounted tool. Its minimum cutting radius is ⅞". The " Little Wonder" nibbler has an aluminum casting, weighs only 7½ pounds. It is 10" long, comes equipped with a universal motor, three conductor 8' rubber cord and connections. All rotating parts have anti-friction bearings, gears are precision hardened. Full details from manufacturer.

Circle Inform-A-Gram No. A20.



This Improved Miter Machine is arranged with two 7" diameter saws cutting right and left sides of the molding at the same time. Production in either wood, aluminum or plastics may be increased as much as 150%. Driving spindle runs on precision ball bearings, motor is 1/3 HP running at 1725 rpm. Provision is made for the installation of a special mechanism for automatic saw engagement and disengagement, which is driven by a further 1/3 HP motor. Normal operation of this vertcial movement is by foot or hand lever, but with the additional attachment a further production increase of 20% is obtained. Approved Devices Co., 525 Woodward Ave., Detroit 26.

Circle Inform-A-Gram No. A21.



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Circle No. A22.

Illustrated is the line of integrated inspection and gaging equipment recently shown by the DoALL Company in New York. Featured is the "Isotope of Gold" #198, which measures to millionth accuracy through a monochromatic light. The newly designed monolight and new plastic gage block case were also featured, along with comparators, indicators, micrometers, optical flats, surface plates and cylindrical, thread, and snap gages. The system for dimensional quality control and accuracy is based on the constancy of a light wave length. It shows how to save waste and man hours in the mass production of interchangeable precision parts. Literature on these products and techniques is available from the DoALL Co., Des Plaines, Ill.

Circle Inform-A-Gram No. A23.

Micro-Miller by Eric S. Bachmann, 27-11, 41st. Ave., Long Island City 1, N. Y., has a half circle protractor dove-tail guiding the spindle into a vertical, horizontal, or any intermediate position. Drive and head may be locked in any position of a 90° arc. Horizontal table travel 3½" x 8⅝", longitudinal 4", cross 3⅜" and vertical 4¾". Pedestal mounted.
Circle No. A24.

12" High Precision Rotary Table recently released by Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, Calif., is made in sorbocast casting for greater strength, has 4 longitudinal T-slots for increased versatility. The top is graduated from 0 to 360° and the dial graduated in minutes for high precision indexing. Other engineered features include: adjustable marker for fast set-up; eccentric cam disengaging the worm for high production indexing; adjustable stop for positive return and to take up wear; and a 7¾" dia. hold-down ring for added rigidity. Special center-clamping device provided. Accurate to .0005" in concentricity run out, .001" parallel.

Circle Inform-A-Gram No. A25.

MS-2 Machinist Scriber has just been added to the small tool line of Moody Machine Products Co., Inc., Providence, R. I. This scriber is designed to fit the hand for a safe-sure grip on the tapered ends. While the knurled non-slip area rests between the thumb and forefinger, both marking ends are properly precision tapered, heat-treated and polished for pinpoint metal marking. These scribers measure nine inches in overall length and are available in dozen or half dozen quantities in an attractive sturdy box that protects the fine points of every tool. The illustration shows the scriber in action on a screw machine cam blank.

Circle Inform-A-Gram No. A26.

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Severance
MIDGET MILLS CHATTERLESS COUNTERSINKS
SPECIAL CUTTERS—REGRINDING SERVICE
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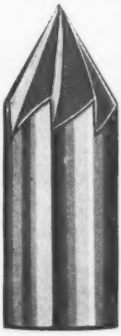

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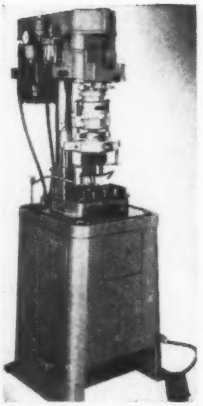
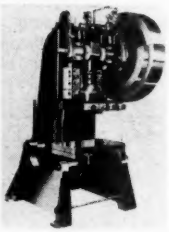
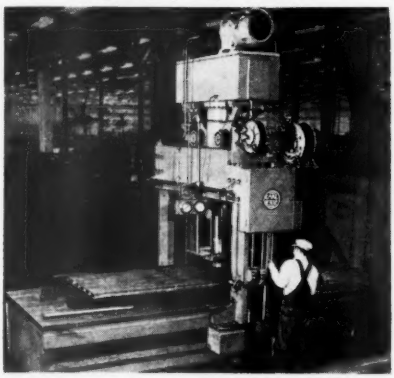


Tapping and Drilling Machine by the Ettco Tool Co., Inc., Brooklyn 37, N. Y., is electric-air controlled. Designed for use with either multiple or single spindle drilling and tapping heads, and with provision for interchangeable work holders, the machine can handle a wide range of drilling and tapping requirements at high production rates. Continuous automatic cycle or single stroke operation.
Circle No. A27.



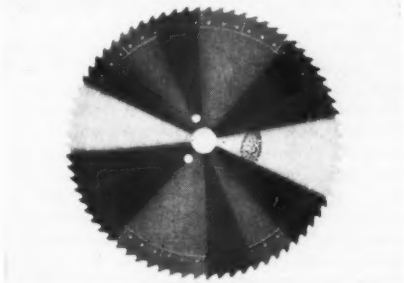
Model 60 Press-Rite Power Press by Sales Service Machine Tool Co., 2363 University Ave., St. Paul 4, Minn., features built-in tie rods practically eliminating deflection on heavy operations. Also Airflex clutch and brake system. Full details from manufacturer.
Circle No. A28.

The Travelling Head Straightening Press pictured is the smallest of a complete line by Lake Erie Engineering Corp., Buffalo, N. Y. The



presses have capacities from 200 to 2000 tons, feature optional two-speed ram travel in both longitudinal and transverse directions over entire bed. Full data from the manufacturer.
Circle Inform-A-Gram No. A29.

Metal Cutting Saw with new segmental design and 30% more productive life than any other has just been announced by Henry Disston & Sons, Inc., Dept. TP, Philadelphia 35, Pa. Called the Disston "Chromos," the new saw features segments locked together by flexible



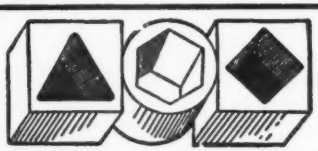
tightening pins instead of rivets. This design ensures perfect alignment of the segments around the cutting edge, and gives longer life to the saw because there are no aligning rivets to limit resharpening. It also makes possible quick replacement and automatic alignment of segments. Available in diameters from 11 to 63", in tooth spacings for any ferrous or non-ferrous metals.

Circle Inform-A-Gram No. A30.

This Combination Truck and Drain Rack loads automatically, is designed for industrial users of solvents, cutting oils, and detergents. It is manufactured by the Palmer-Shile Co.,

16039 Fullerton, Detroit 27, Mich. Construction is all-welded heavy angle iron frame with sturdy steel tubing for handles, which may be removed to conserve floor space, one pair serving any number of trucks. Two 8" roller bearing wheels, weight approximately 90 lbs.

Circle Inform-A-Gram No. A31.



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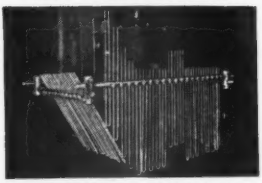

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The modern home of finer production tools

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 8, MICHIGAN

. . . Tipped Tools, from page 174

H.S.S. tools are left in the fixture until the tip reaches a temperature of approximately 1100° F (dull red), after which the tool is removed and allowed to cool naturally in air. Figure 8 shows the microstructure of a H.S.S. tip brazed and hardened in one operation.

Figure 9 shows a rather novel application of this procedure. A H.S.S. tip is here brazed and hardened in place on a shank made of SAE 9255 steel. A suitable induction coil was made up which was coupled closely to the area of the tip and seat, and loosely coupled to the gooseneck area. Power was applied to heat the tip to its brazing and hardening temperature and the gooseneck area to a somewhat lower hardening temperature. As soon as these temperatures had been attained, the assembly was carefully transferred to the quenching fixture shown in Figure 7, where the brazed joint was cooled sufficiently in a few seconds to allow further handling. The results were a tip having a hardness of approximately 63 Rockwell "C"-scale and a spring gooseneck with a hardness of approximately 45 Rockwell "C".

Induction heating provides a suitable brazing method which is applicable to either high-speed-steel or carbide tool tips. The process offers excellent reproducibility, rapid production, and parts which require only a minimum of cleaning.

Fig. 9. H.S.S. Tip Brazed and Hardened, by Induction, on Shank of SAE 9255 Steel

Steel Founder's Society Appoints Product Development Engineer

Appointment of **James H. Lowe** as product development director of Steel Founders' Society of America is announced by F. Kermit Donaldson, executive vice president of the society.

Following completion of his engineering education at the University of Wisconsin, Mr. Lowe joined the engineering staff of E. I. duPont de Nemours & Company, becoming technical supervisor and supervisor of all operations of the duPont military explosives division. Subsequently he joined the Wehr Steel Company organization as research engineer prior to his advancement to the post of technical and research director. In this capacity he was in charge of quality control, sand operations, statistical control of plant operations, metallurgical developments concerning armor, and the Wehr plant training program.

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PO-RO CLAMP SUPPORT BLOCKS

½" to 10" height (in 1/16" adjustments) with one set of blocks.

HARDENED STEEL
TRUE FLAT SURFACES
SLIP-PROOF SERRATIONS

$11.75 PER SET CONSISTING OF
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4—No. 2 half blocks—1" to 2½"
4—No. 3 half blocks—2½" to 6½"

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3918 Wesley Terrace, Schiller Park, Ill.

Fast, Accurate Measurements With the AMIC "Quick-Action" Vernier Caliper

AT NEW LOW PRICES

The perfect tool for machine shop, tool room inspection and Quality Control. A flick of the thumb and you've got your external and internal dimensions. Knife-edged hardened jaws provide exact thread measurements. A depth gage blade gives speedy measurements. AMIC designed and made exclusively for AMIC by an outstanding European manufacturer.
Scientifically engineered, painstakingly machined, packed in a sturdy leatherette case. A tool without rival.
Size 6" #21B, Graduation 1/40", vernier reading .001.
#22B, Graduation 1/40" and full MM, vernier reading .001 and 1/10 MM.
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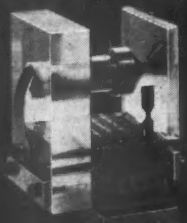

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BATTLE CREEK, MICHIGAN

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New Automatic Equipment for Thread Cutting

A new thread cutting and worm cutting machine, when installed on a standard lathe, increases speed in cutting threads and worms by nine times over that of lathe cutting by the methods generally used; and two times as compared with thread milling.

On a recent trial covering 1¼" diameter S.A.E. 1335 steel 4 threads per inch, Acme, no tolerance was found in the lead in 42" or 168 threads of cutting. In other words, the exact lead was maintained.

The novel feature of this new equipment is that the actual cutting is done by means of a tool which moves around the work piece eccentrically at high speed, in a single continuous operation.

The equipment cuts long standard vee threads, acme, buttress and rounded threads, and, within close limits, modified square threads.

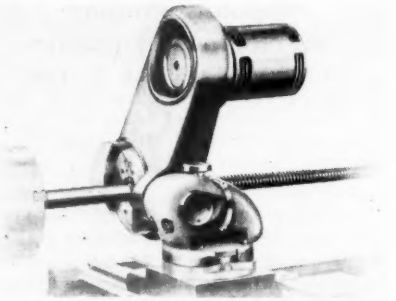

Photo courtesy National Threading Machine Co.

Exactness of thread pitch and smooth thread surfaces are qualities produced by this machine. Plain and alloy steel, nonferrous metals, cast iron and plastics can be cut by this process.

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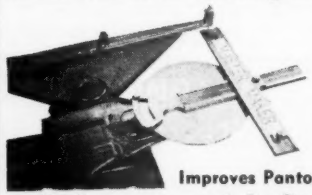

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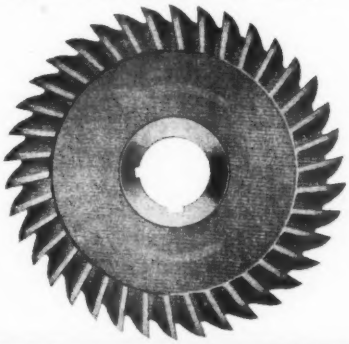

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4 x 5/32 x 1"	— 30 —	7.90
4 x 3/16 x 1"	— 30 —	8.20
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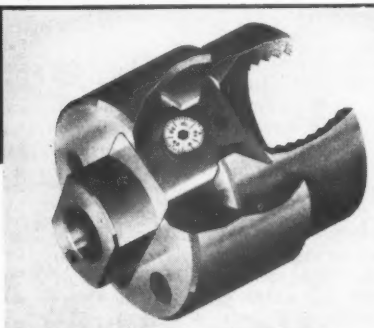

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. . . Q. C. at Tank Plant, from page 69

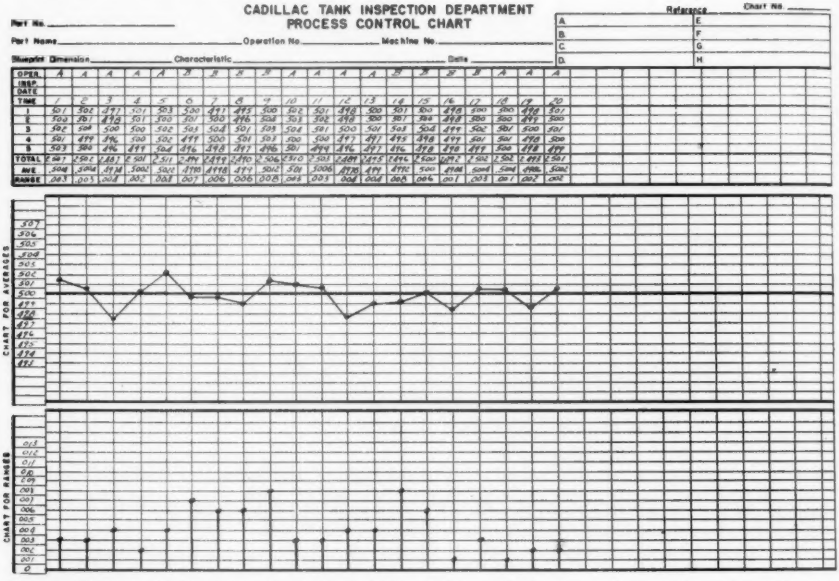

Fig. 3. The sample chart developed in a study of the machining operations performed on the five skate pads of the vision cupola. The surfaces of these pads have to be parallel within .005" full indicator reading.

As can readily be seen, two of the three variables entered into the "out of control" of this part. Conventional inspection methods would not have pinpointed the trouble, but by taking accurate measurements, compiling the figures and carefully analysing them, the operation was brought into control with the minimum amount of expense, trouble and fixturization change.

Another interesting case is charted in Figure 3. The operation was that of milling the five skate pads on the Commander's Vision Cupola, Figure 1. The engineering tolerance called for dimensional tolerance of .010" and for all five pads to be parallel within .005", full indicator reading. Conventional inspection methods showed all parts to be within the .010" dimensional tolerance but only about 50% to be parallel within .005" full indicator reading.

Before setting up a statistical quality control chart the entire setup was checked by mounting an indicator on the spindle of the machine and passing all fixture locating pads beneath it. Out of parallelism was less than .0003" full indicator reading. Once more, it was decided to set up a statistical quality control chart to see if the trouble could be located and possibly corrected. A sample of five was used once again as each skate pad could be classed as one part. After thirteeen samples had been charted it was noted that all parts were dimensionally within tolerance but only operator A's pieces checked out to the required parallelism.

Operator B was asked to set up and run a piece and he was carefully watched. The piece was checked and results are shown at #14. The average is well within tolerance but the range was bad. He was asked to run another piece and the result is shown at #15. The clamping was the only function that varied between

(Continued on page 192)

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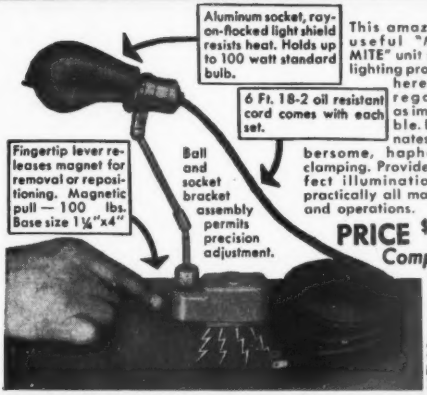
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. . . Q. C. at Tank Plant, from page 190

operators A and B. Operator B used quite a bit more clamping pressure than A. An impact torque wrench was furnished at time #16. Both operators were charted once more and the results are shown from #16 to #20. As can be seen, the operation was brought into control very nicely.

This illustrated how statistical quality control pinpointed the human variable which would be very difficult to do by conventional methods.

Another interesting application of statistical quality control is shown on the chart of Figure 4. The part was the suspension support housing. The engineering tolerance was .003", and the piece was tooled for a vertical turret lathe.

Conventional inspection methods were used to check this part. A great many were off size on both sides of the tolerance, i.e., too large a bore or too small. The undersize bores could be reworked, giving a good piece. The oversize bores were scrapped. A statistical quality control chart was set up as shown in Figure 4. As can be seen by the chart, parts fell on the high or low side regardless of tool changes or operator change. To completely analyze this chart, a curve was constructed as shown in Figure 5 with the engineering tolerance marked.

As can be seen by the curve, all parts in area "A" are salvagable, all parts in area "B" are good and all parts in area "C" are scrap. Insofar as this curve is determined by material, man and machine, the engineering tolerance area can be changed in the curve by changing the tool setting and a condition can be set up as shown in Figure 6.

With this condition all parts in area "A" are salvagable and all parts in area "B" are good and there are no scrap parts. With these visual facts and charts it is very easy to reach a decision. As can be seen by the charts the machine could not

(Continued on page 194)

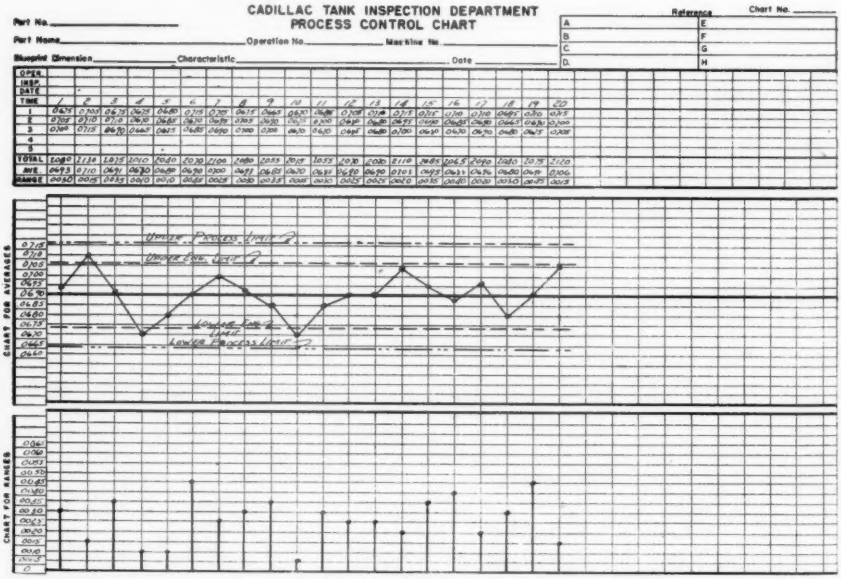

Fig. 4. A sample chart on the dimensional control of boring openings in the suspension support housing.

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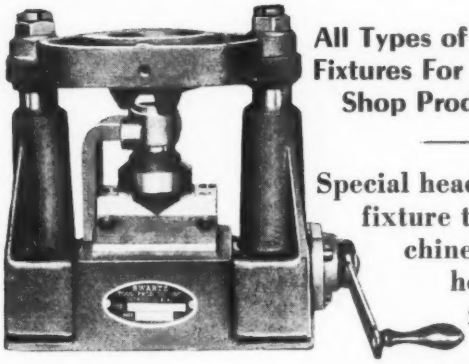

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hold size within engineering tolerance. By changing tool settings, as determined by statistical quality control, oversize parts are eliminated and minimum stock can be left for a subsequent finishing operation. This, too, was the decision reached. After making the change as indicated on the statistical quality control chart parts were provided within engineering tolerance and with a minimum of scrap.

These are three examples showing the use of statistical quality control charts. As can be seen from the accompanying charts, each of the three varables: man, material and machine has been pinpointed, corrected, and brought into control. This could have been done by a tedious cut and try method, but by gathering the facts, placing them upon a chart and using the proved methods or statistical quality control, a rapid and thorough analysis of existing conditions was possible. After analysis corrective measures could be taken as indicated from the charts and processes brought into control.

Statistical quality control is not a cure-all, but is a very valuable tool. When properly used as a tool to collect factual information, it can be put to use in correcting operating conditions and charting the future operating control limits.

All charts shown were prepared for this article and only information needed to illustrate the specific case history is shown on the chart.

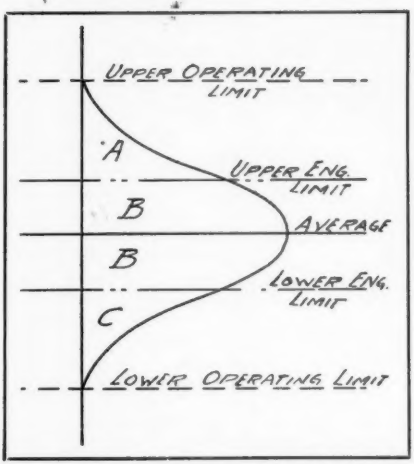

Fig. 5. This curve assists in analyzing the chart shown in Fig. 4. All parts in area "A" are salvagable, those in area "B" are good, and those in area "C" are scrap.

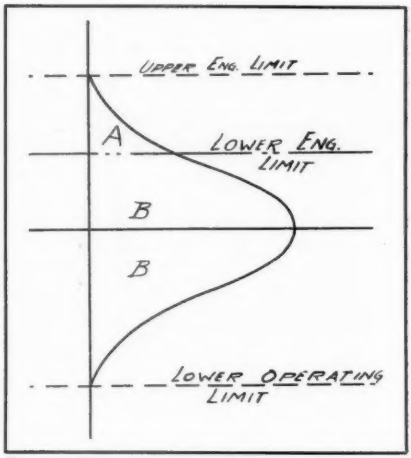

Fig. 6. The engineering tolerance area of the curve in Fig. 5 can be changed by changing the tool setting, so that all parts in area "A" are salvagable, all parts in area "B" are good and there are no scrap parts.

Industry News

Standard Pressed Steel Co. Appointment to the newly created post of regional sales manager for SPS in the Midwest has gone to **Francis J. Kinsella.** Succeeding Mr. Kinsella as manager of the Detroit territory will be **Daniel F. Halgrave Jr.**

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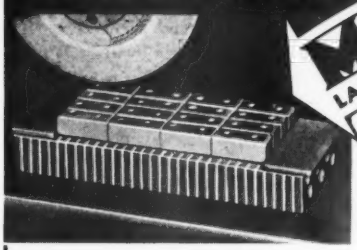

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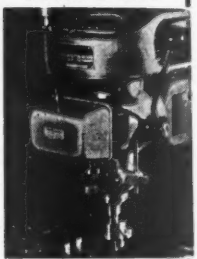

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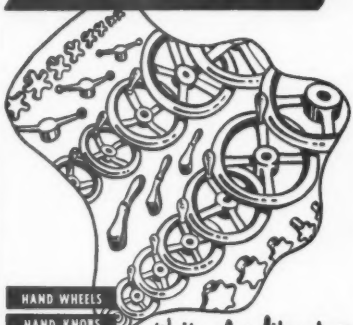

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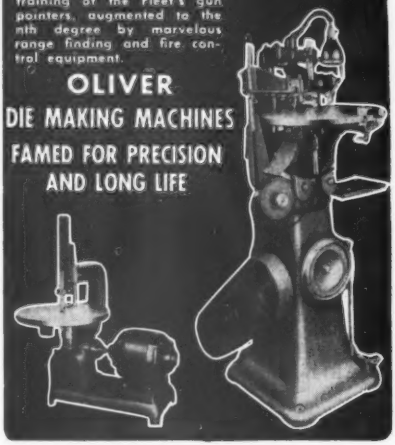
The huge battlewagons and aircraft carriers of the United States Navy, along with its cruisers, destroyers, and other component parts of the Fleet, form this country's traditional first line of defense. The fire power of the Fleet is world famed for its precision and accuracy due to the excellent training of the Fleet's gun pointers, augmented to the nth degree by marvelous range finding and fire control equipment.

OLIVER
DIE MAKING MACHINES
FAMED FOR PRECISION AND LONG LIFE



The Oliver Method of making dies by sawing and filing by machine methods has proved its efficiency in thousands of plants throughout the world. Oliver Die Makers are famed for their long lasting qualities and have been in continuous use in many plants for more than 25 years. Their efficiency, speed and accuracy effect savings in time and costs up to 60%. Simple to operate, Oliver Die Makers offer the added advantage of not requiring skilled labor. Find out for yourself . . . Be Wise, OLIVERize your Toolroom.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

OLIVER INSTRUMENT CO.
1436 E. MAUMEE • ADRIAN, MICHIGAN

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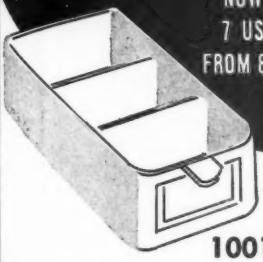
INFORM-A-GRAM KEY NUMBERS

SMALL PARTS CABINETS

NOW AVAILABLE IN
7 USEFUL SIZES—
FROM 8 TO 64 DRAWERS



1001 Time-Saving Uses For Home and Business!

Ideal for small parts...washers...nails...screws...bolts...nuts...drills ...taps...carbide tips...mounted points...tools...brads...tacks...and YOU NAME IT!

All-metal JIFFY Cabinets have a sturdy steel frame with hammered aluminum finish in silver-gray color.

Drawers are of solid aluminum, measuring 1¼" high, 2¾" wide and 5¾" deep. Individual metal drawer guides keep the drawers in a free-sliding position.

Each JIFFY Cabinet is supplied with its full requirement of removable drawer-dividers and index labels.

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TO: HANDY PRODUCTS
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PLEASE SEND IMMEDIATELY THE QUANTITY AND SIZE JIFFY UNIT LISTED BELOW

☐ 64 Drw. @$24.95* ☐ 48 Drw. @$19.95* ☐ 32 Drw. @$12.95* ☐ 24 Drw. @$9.95* ☐ 16 Drw. @$7.95* ☐ 12 Drw. @$6.95 ☐ 8 Drw. @$4.95*

WE PAY ALL SHIPPING COSTS

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Please Ship as Follows:

☐ Open Account, Purchase Order Enclosed.

☐ Check or Money Order Enclosed.

☐ C.O.D.

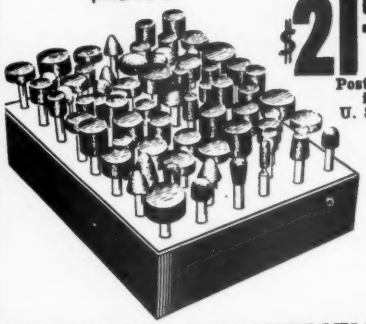
Ohio Customers Add 3% Sales Tax.

72 ABRASIVE WHEELS & POINTS

BRAND NEW PERFECT FIRST QUALITY MOUNTED ON 1/4" STEEL MANDRELS

SAVE UP TO $25.00

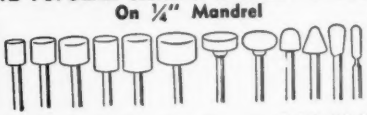
ONLY $21.50 Postpaid in U. S. A.



72 PIECE ASSORTMENT

ON 1/4" MANDREL

12 POPULAR SIZES & SHAPES—6 EACH On 1/4" Mandrel



		Dia.		Depth
1.	1 3/32"	x	1/4"
2.	3/4"	x	1/2"
3.	3/4"	x	1/2"
4.	3/4"	x	3/4"
5.	3/4"	x	3/4"
6.	1"	x	1/2"
7.			
8.	A-61		
9.	A-90		
10.	A-41		
11.	A-111		
12.	A-24		

	Dia.		Depth
	3/4"	x	1/4"
	3/4"	x	1/4"
	1/2"	x	1/2"
	3/4"	x	1/2"
	3/4"	x	1/2"
	1"	x	1/4"
	1/4"	x	3/4"

Make no mistake. Do not let the unheard of low price mislead you. This is NOT "surplus" goods, inferior merchandise or seconds. Every one of the Wheels and Points is brand new, first quality and perfect. The type of mounting, quality of steel mandrels, grade of abrasive materials are identical to the finest on the market. Only because of our buying power, low overhead and small margin is such a sensational bargain possible.

IDEAL FOR ALL INDUSTRIAL PURPOSES

Plants all over the U. S. have been using Schupack wheels and points for years with excellent results. Our assortment includes the most popular sizes and types. However, we can supply ANY ASSORTMENT you want. List the types and sizes and we will fill your order at no extra cost.

10 DAY FREE INSPECTION OFFER

Drop us a line on your stationery, SEND NO MONEY. We will ship any assortment to any rated concern in America on approval. We invite you to make any comparison you like.

144 ABRASIVE WHEELS & POINTS

BRAND NEW PERFECT FIRST QUALITY MOUNTED ON 1/8" STEEL MANDRELS

SAVE $65.10

ONLY $28.50 Postpaid in U. S. A.

ACTUAL LIST VALUE $93.60

Here's What You Get—List Value $93.60
Our Price $28.50—You Save $65.10

16 MOST USEFUL SIZES—9 OF EACH SIZE

Style	Quantity	List Price	Style	Quantity	List Price
W-204	9 @ 65¢	$5.85	B-41	9 @ 80¢	$7.20
W-182	9 @ 50¢	4.50	B-44	9 @ 70¢	6.30
W-201	9 @ 55¢	4.95	B-70	9 @ 70¢	6.30
W-200	9 @ 55¢	4.95	B-104	9 @ 70¢	6.30
W-185	9 @ 55¢	4.95	B-61	9 @ 75¢	6.75
W-203	9 @ 60¢	5.40	B-135	9 @ 55¢	4.95
W-175	9 @ 55¢	4.95	B-111	9 @ 75¢	6.75
B-121	9 @ 70¢	6.30	B-101	9 @ 80¢	7.20

GUARANTEE

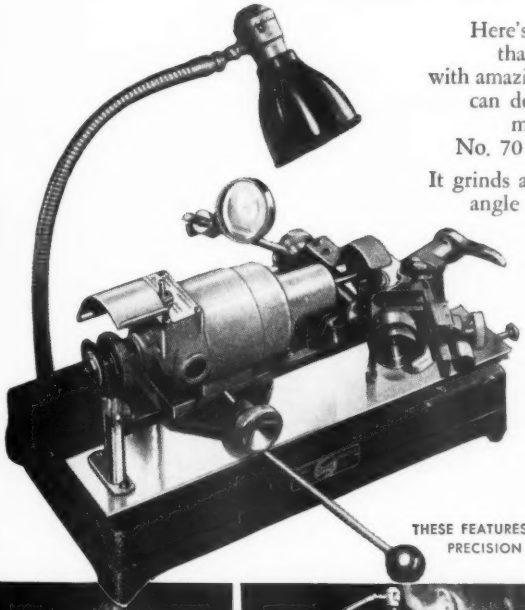
If after 10 days you are not fully convinced that this is the greatest wheel and point value in the Industry, return the set at no cost or obligation on your part.

EACH ASSORTMENT COMPLETE IN HANDY, STURDY CONTAINER AT NO EXTRA COST. SATISFACTION GUARANTEED!

NEW 1953 ILLUSTRATED CATALOG SENT FREE ON REQUEST!

SCHUPACK SUPPLY COMPANY - 7331 Cottage Grove Ave., Dept. TO-15 Chicago 19, Ill.

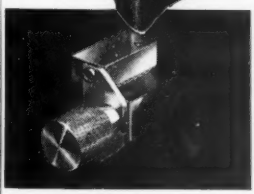
This new DUMORE® grinder eliminates hand sharpening of small drills



Here's a remarkable new grinder that sharpens small twist drills with amazing speed and precision. You can do away with expensive shop maintenance of 2-lip drills — No. 70 to ¼".

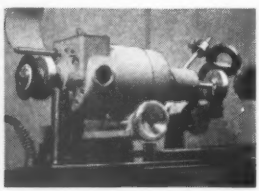
It grinds a drill point to any included angle from 90° to 150°, clearance angles 5° to 15°. Quickly sharpens and reclaims small-size, dull and broken drills. Dumore sharpened drills stay sharp longer, last longer. Get correct hole size, better hole finish every time. Hold scrap loses to a minimum.

THESE FEATURES MAKE THE DUMORE PRECISION GRINDER BETTER



EXCLUSIVE FEED-IN ATTACHMENT — Eliminates breakage and wheel gouging. Allows fine control of finish cuts. Speeds difficult sharpening, requiring extreme changes of point or clearance angle.

BROKEN DRILL RECLAIMER —Drills can be rough ground and reshaped on roughing wheel . . . then sharpened. (Grooved drill rest also serves as holder and locating fixture for diamond wheel dresser.)



ECONOMICAL WHEEL COST — Only uses wheel face. No expensive, shaped wheels. Individual wheels for web-thinning and roughing, eliminating frequent wheel dressing, assure longer wheel life.

Ask your nearby industrial distributor for a demonstration of this time- and money-saving Dumore Drill Grinder, or write

THE DUMORE COMPANY

1313 Seventeenth Street • Racine, Wisconsin

add HUNDREDS of productive hours with BALAS COLLETS

BALAS also makes:

- Solid Collets
- Special Collets
- Master Collets
- Squirrel Cage Pushers
- Master Pushers
- Feed Fingers

You can actually add hundreds of productive hours by using Balas Master Collets, either Martin or "CB" type, since they permit rapid change over from one stock size or shape to another, merely by changing the pads without disturbing the setting of the collet.

Balas special cam-grinding on the taper to a "cloverleaf" shape prevents "sticking" in the chuck, permits faster opening and closing, allows tighter gripping and reduces chatter. Precision manufacturing processes, special heat treating and rigid inspection insure the utmost accuracy and longer life.

More and more concerns are experiencing unprecedented results with collets made by Balas. You, too, can profit from Balas Collet engineering...and the right time to start saving time with Balas Collets is now!

BALAS COLLET MANUFACTURING CO.

1563 EAST 27th STREET CLEVELAND 14, OHIO

WORLD'S LARGEST MANUFACTURER OF COLLETS EXCLUSIVELY

BALAS